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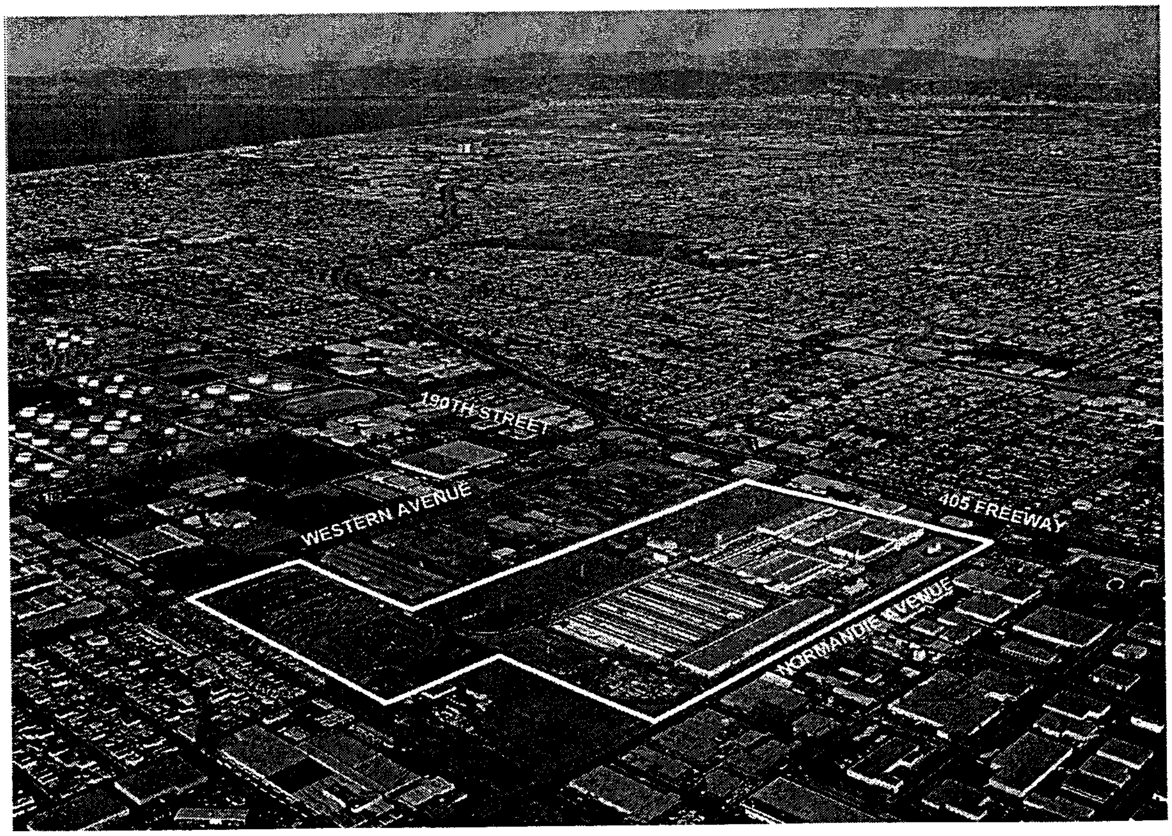
DRAFT

Parcel B Supplemental Sampling and Analysis Plan

Boeing Realty Corporation
C-6 Facility
Los Angeles, California

March 1998



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Los Angeles
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March 1998

Prepared by
Integrated Environmental Services, Inc.

For
Boeing Realty Corporation

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SIGNATURES

PARCEL B SUPPLEMENTAL SAMPLING AND ANALYSIS PLAN

BOEING REALTY CORPORATION C-6 FACILITY

LOS ANGELES, CALIFORNIA

MARCH 1998

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CONTENTS

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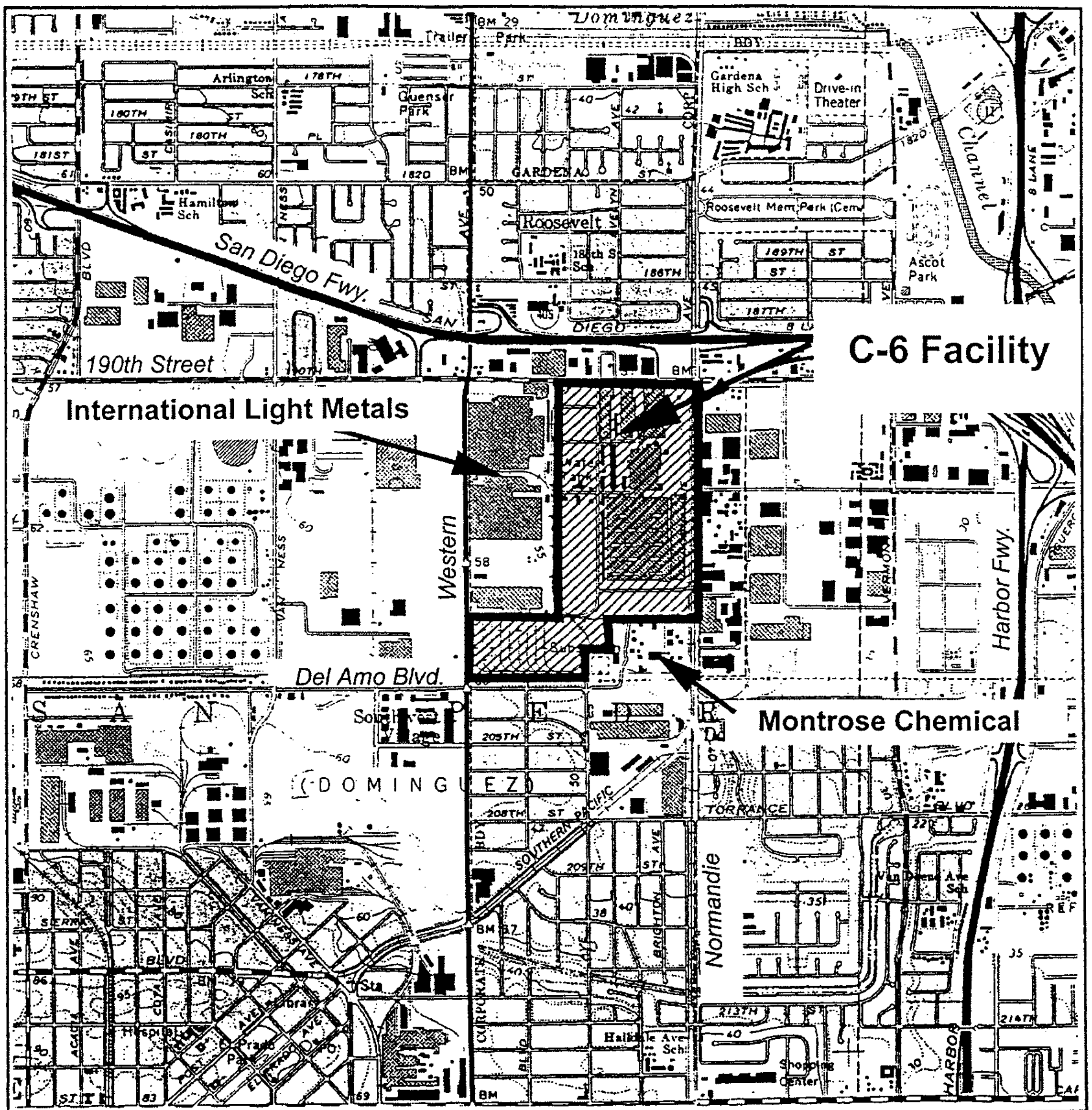
1. INTRODUCTION

The Boeing Realty Corporation (BRC) C-6 facility in Los Angeles, California, is currently undergoing a phased redevelopment. The facility has been used in the manufacture, storage and distribution of aircraft parts and components for over 45 years. Storage and distribution operations are active in the southeastern corner of the facility, but the northeastern and western portions of the property are being redeveloped for commercial use (Figure 1-1).

As shown in Figure 1-2, the site has been divided into three parcels. Redevelopment of the northeastern portion of the property, Parcel A, began in 1996 and is ongoing, while redevelopment of the western portion, Parcel B, has just begun. The southern portion, Parcel C, will be redeveloped at a later date. As part of the cleanup and redevelopment effort, environmental samples will be collected and analyzed for constituents consistent with past and present site operations. Analytical results obtained from the sampling will be used to determine which areas (if any) contain constituents at levels requiring removal and/or treatment. This sampling and analysis plan (SAP) presents the approach, objectives, and procedures to be implemented for Parcel B.

Phase I environmental assessments have been conducted for all parcels comprising the C-6 facility (CDM 1991a, K/J 1996a, b, and c), and Phase II soil investigations have been conducted for the two parcels currently undergoing redevelopment (CDM 1991b, K/J 1997 and 1998). After release of the latest Phase II report for Parcel B, however, numerous aerial photographs were discovered in an unused portion of the C-6 administrative building. A review of the photographs for Parcel B, which were taken between 1952 and 1955, has identified three areas of environmental interest near the central portion of Parcel B. These *areas of interest* (AOIs) are:



Base Map: U.S.G.S. 7.5 Minute Topographic Map,
Torrance, California Quadrangle, 1981.

0 2000 4000
Approximate Scale in Feet

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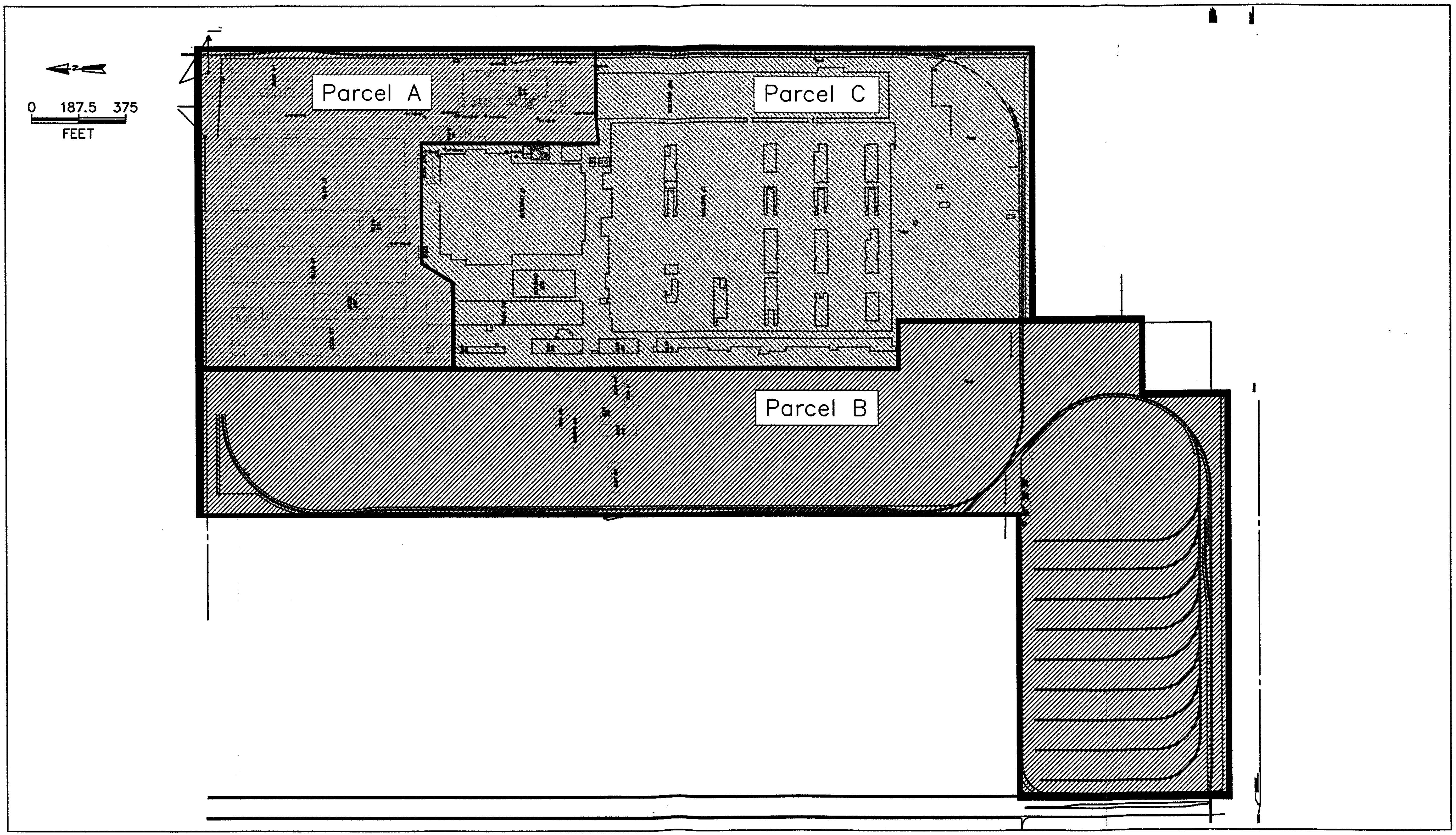
Figure 1-1
C-6 Facility and Vicinity



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TITLE:
Boeing C-6 Facility
Parcels A, B, and C

DWN: JDL	DES.: JDL	PROJECT NO.: Boeing C-6	
CHKD: JFH	APPR: JSB	FIGURE NO.: 1-2	
DATE: 3-25-98	REV.: 1		

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- Concrete basins adjacent to the rectifier building
- An array of electrical transmission towers
- Two small electrical substations

Before discovery of the photographs, the existence of these structures was unknown; consequently, their locations were not comprehensively sampled during previous investigations. In addition, the soil beneath the cluster of buildings at the center of Parcel B was not sampled during earlier Phase II soil characterizations due to ongoing activities within the buildings. The building cluster is considered the fourth AOI and will be investigated during demolition and redevelopment.

This SAP has been developed to supplement the previous Parcel B investigations and provides procedures for collecting and analyzing soil samples from each of the four AOIs. All available site records and photographs were reviewed prior to preparation of this document.

1.1 SAMPLING OBJECTIVES

The objectives of this Parcel B sampling and analysis program are to refine the soil characterization data for the newly identified AOIs, support future remediation (if deemed necessary), and support the post-demolition risk assessment of potential health risks to future users of the redeveloped parcel. To accomplish these objectives, the following data quality objectives (DQOs) have been developed for this project.

- Identify and delineate potential source areas as they relate to former operations.
- Develop sufficient data to support potential remediation.
- Determine the horizontal extent and vertical depth of impacted soil to facilitate the post-demolition risk assessment.

1.2 SITE BACKGROUND

1.2.1 C-6 Facility Description

The C-6 facility is located at 19503 South Normandie Avenue in Los Angeles, California, just south of the San Diego Freeway (I-405) and approximately one mile west of the Harbor (I-110) Freeway. The property is bordered by 190th Street to the north, Normandie Avenue to the east, 203rd Street to the south, and Western Avenue to the west (Figure 1-1). The 170-acre property has been divided into three parcels, A, B, and C, as shown in Figure 1-2. Parcel B, the subject of this report, forms the western extent of C-6, and is bordered by industrial sites. The Capital Metals facility and the Lockheed Martin Corporation (LMC) former International Light Metals (ILM) facility are adjacent to Parcel B on the west. A Los Angeles Department of Water and Power (DWP) electrical substation is adjacent to the southern boundary of C-6, and Montrose Chemical is just east of Parcel B.

1.2.2 C-6 Facility History

Aerial photographs indicate that C-6 and the surrounding area were farmland prior to the 1940s. During the early 1940s, the U.S. Defense Plant Corporation (PLANCOR) began industrial development of C-6 and the surrounding area as part of the war effort. An aluminum reduction plant was constructed on the site, and the Aluminum Company of America (ALCOA) operated the plant for the government until it closed in September 1944. Following the war, the War Assets Administration used the site for temporary storage for two years. In 1948, the Columbia Steel Company purchased the property but made no significant changes to the plant (CDM 1991a).

In March 1952, the US Navy purchased the property and established the Douglas Aircraft Company (DAC) as the contractor and operator of the facility for the manufacture of aircraft parts. DAC purchased the property from the Navy in 1970 and used the facility to manufacture components for various commercial and military aircraft until approximately 1992. DAC has used the C-6 facility for the storage and distribution of aircraft parts since cessation of manufacturing activities (K/J 1996a, b, c).

McDonnell Douglas Realty Company (MDRC) began a phased cleanup and redevelopment of the C-6 facility 1996. In August 1997, BRC became the site operator responsible for cleanup, when its corporate parent, the Boeing Company, acquired McDonnell Douglas.

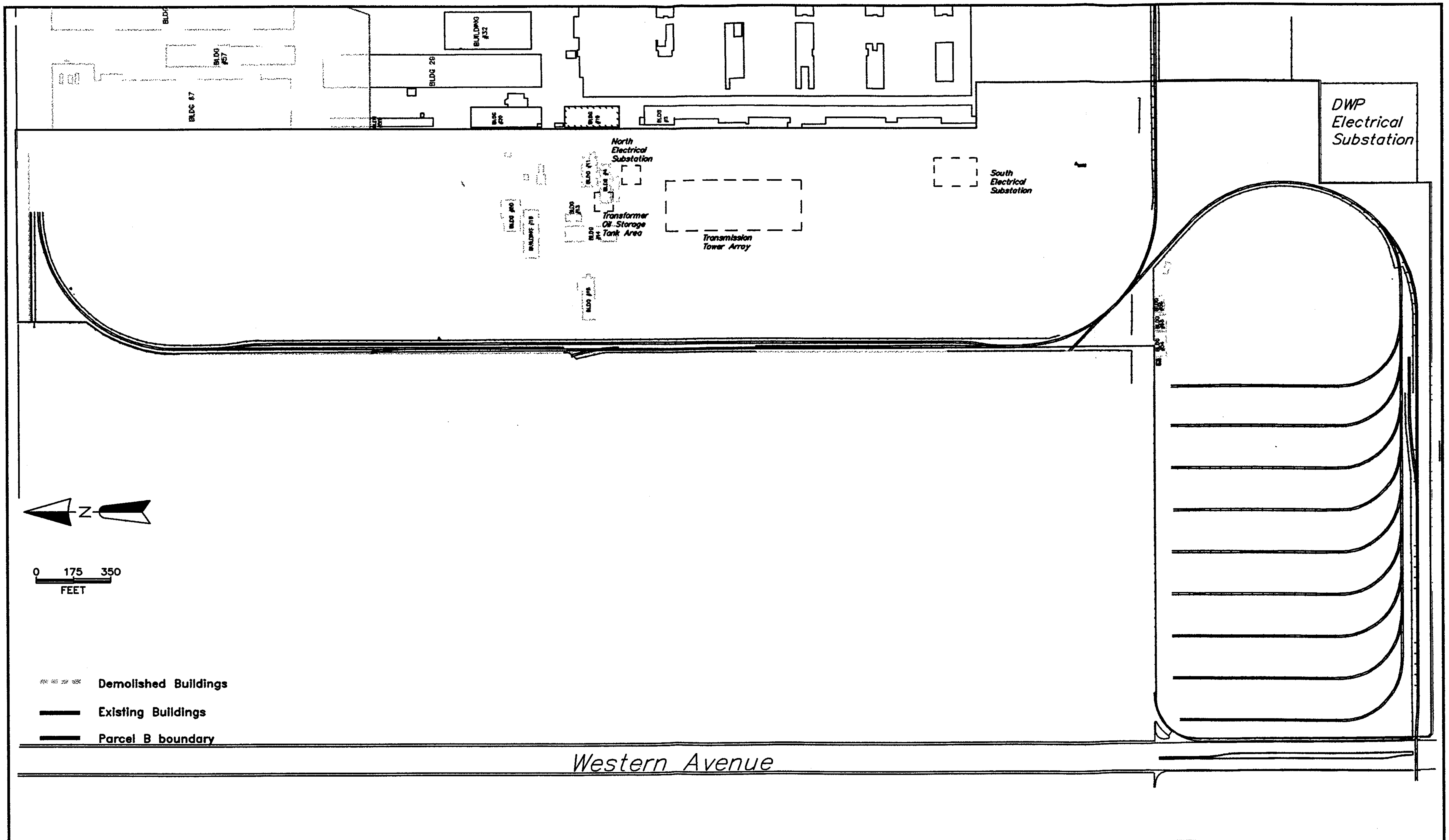
Parcels affected by each phase of the redevelopment undergo, as required, environmental investigation, assessment, and remediation prior to construction. To date, all structures in Parcel A have been razed or relocated, and demolition of structures in Parcel B has begun.

1.2.3 Description of Parcel B

Parcel B (Figure 1-3) has been used primarily for employee parking since DAC began operating the facility in 1952. A small cluster of buildings at the center of the parcel separates the parking area into northern and southern lots, and the tool and scrap storage yards occupy the southern leg of the parcel. Each of these areas and features of interest are presented in Sections 1.2.3.1 to 1.2.3.4. The discussion in these sections is based on a review of historical C-6 facility records and the newly discovered aerial photographs.

1.2.3.1 Northern Parking Lot

The northern parking lot has been used for employee parking since PLANCOR developed the property from farmland in the early 1940s (HMC 1993). Aerial photographs show that DAC enlarged and repaved the existing parking lot in October 1952 when it began operating the



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INTEGRATED Environmental Services, Inc. 3990 Westerly Place, Suite 210 Newport Beach, CA 92660 (714) 852-9050	TITLE: Boeing C6 Facility Parcel B Site Map	DWN: JDL	DES.: JDL	PROJECT NO.: Boeing C-6
		CHKD: JFH	APPD: JSB	FIGURE NO.: 1-3
		DATE: 3-23-98	REV.: 2	

BOE-C6-009684

facility for the U.S. Navy. DAC installed a new north-south road (which became known as Denker Road) to provide employee access to the parking lot from 190th Street and to provide better site access for large trucks delivering supplies to the facility. Aerial photographs show that the road and parking lot were completed by December 1952. No known industrial or manufacturing operations have occurred within the northern parking lot.

1.2.3.2 Parcel B Building Cluster

A cluster of seven buildings occupies the center of Parcel B, just south of the northern parking lot. These buildings were used primarily for office space and storage. Some of the buildings, however, housed operations involving the potential use or presence of chemicals. These buildings and other features of interest within the building cluster area are described in the paragraphs below.

Building 4

Building 4 is a 3,000-square-foot structure which housed electrical equipment. All electrical power for the C-6 facility enters through control boxes in this building. Aerial photographs taken between 1945 and 1956 show an electrical substation adjacent to the south side of Building 4. The date of the substation's removal is unknown. A room in the eastern portion of the building was used for battery charging operations (K/J 1996c). Building 4 will be the last structure removed from Parcel B since site power must be re-routed before demolition.

Building 11

The 5-story, 20,000-square-foot Building 11 was used most recently to store maintenance equipment, office equipment, and records. Before being used for storage, Building 11 housed maintenance operations (K/J 1996c).

Building 14

Building 14 housed the company store and was used most recently for records storage. The 7,500-square-foot building was present when DAC began converting the property for aircraft manufacture. It is not known how the building was used before DAC began operating the property (K/J 1996c).

Building 15

Building 15 is a 6,200-square-foot brick building that originally housed the payroll department and a photography laboratory. The building was most recently used as a shipping office (K/J 1996,c).

Building 18

Building 18 is a two-story wood-frame office building that has always been used for office space. Dry-type electrical transformers were observed in the basement during a site walk through in 1996 (K/J 1996b).

Building 60

Building 60 is a two-story building north of Building 18. DAC personnel indicate that the building and two wood-frame observation towers, referred to as 60A and 60B, were used in the testing of radar or radio equipment (K/J 1996b).

Transformer Oil Storage Tanks

Three 8,000-gallon, aboveground transformer oil storage tanks were located southeast of Building 13 at the time ALCOA operated the property. Previously unknown, the tanks are visible in one of the newly discovered aerial photographs (dated April 1952) and in an ALCOA drawing of the facility (dated May 1948). Both the photograph and the drawing show a spill containment berm around the tank area, which measures approximately 50 by 50 feet. The tanks were removed sometime in 1952 or 1953 during construction of the southern parking lot. Aerial photographs taken in 1953 during construction of the lot show that the tanks had been removed.

1.2.3.3 Southern Parking Lot

The southern parking lot was constructed sometime in 1953 to provide additional space for employee parking. A majority of the southern parking lot was filled with approximately 4 feet of soil during construction of the lot and Denker Road to raise the existing grade to match that of the surrounding area. The precise thickness of fill required has not been found in the reference documents provided. However, continuous core soil borings taken from the southern parking lot during the Kennedy/Jenks Phase II investigation (K/J 1998) show a uniform, 4-to-5 foot-thick layer of sandy clay beneath the asphalt.

Aerial photographs taken in April 1952, before construction of the southern parking lot, show that a large array of electrical transmission towers and two small electrical substations (the north and south substations) were present in Parcel B south of the building cluster. Aerial photographs taken during construction of the parking lot indicate that the tower array and south substation were removed during construction. The north substation remained in operation after the southern parking lot was constructed. The date when the north substation was removed is not available in the site records reviewed.

Building 3, just east of the southern parking lot, was used by ALCOA to house rectifiers. Rectifiers were used to convert the large amounts of electricity required for aluminum production from alternating current to direct current. The conversion was necessary to protect workers from electrocution during production.

An array of concrete compartments are observed west of Building 3 in photographs taken between 1952 and 1953. The precise use of the compartments is unknown, but it is believed they received cooling water from the rectifier building. The compartments were backfilled with gravel when DAC converted and expanded Building 3 to house administrative offices. Recent excavations in Parcel B have unearthed some of these structures, which appear very clean with no visible staining or cracking. The compartments excavated to date are uniformly constructed and identical.

1.2.3.4 Tool and Scrap Storage Yards

The tool storage yard occupies 1.1 million square feet in the southwestern portion of Parcel B. The area was used to store a vast quantity of master tools used to make aircraft parts. Most of the tools were stored in wooden crates (K/J 1996c).

Aerial photographs indicate that construction of the tool storage yard began around 1953. The area appears to have been unused until DAC began operating the property. Nine railroad spurs were installed around 1955 to provide rail access to the yard. The spurs divide most of the tool yard into north-south strips. Aerial photographs show the yard to be complete and in use by November 1955.

Three small buildings, 54, 55, and 56, were located near the entrance gate to the tool yard. These buildings were used for office space and storage of forklifts, service vehicles, and tools. An electrical transformer was adjacent to Building 54. Staining on the transformer pad indicates that oil has leaked from the pad. However, soil samples collected from the area contained no polychlorinated biphenyls (PCBs) (K/J 1996c and K/J 1998).

The scrap storage yard is located at the southernmost portion of Parcel B. The narrow strip occupies approximately 100,000 square feet of land and was used to store unused and miscellaneous equipment (K/J 1996c).

1.3 DOCUMENT ORGANIZATION

This SAP has been organized into eight sections:

Section 1, ***Introduction***, presents the purpose and organization of the report. The operational history of C-6 and a description of Parcel B are also included.

Section 2, ***Previous Investigations***, presents a summary of previous Parcel B investigations and their conclusions.

Section 3, ***Sample Location and Analysis***, discusses the supplemental sampling approach proposed for Parcel B, indicating where the soil samples will be collected and which analyses will be performed. Also described are the types of quality assurance/quality control (QA/QC) samples required to ensure the usefulness of the analytical results.

Section 4 , ***Sample Identification and Designation***, presents the methods for identifying samples after collection.

Section 5, ***Sampling Equipment and Procedures***, describes the equipment that will be used to collect soil samples and provides the proper steps for calibrating field and laboratory instruments. Also described are the equipment decontamination procedures to be followed when cleaning field equipment.

Section 6, ***Sample Handling and Analytical Procedures***, describes the procedures to be used in handling and preserving soil samples after collection. The types of containers required to store and ship samples to the laboratory are also provided. In addition, field measurements and the analytical methods required for sample analysis are presented in this section.

Section 7, ***Sample Handling and Custody***, describes the procedures to be followed when transferring custody of soil samples from the site to the courier, and from the courier to the laboratory. In addition, the types of logs and field documentation required for the Parcel B SAP are discussed.

Section 8, ***References***, lists the literature cited in this plan.

2. PREVIOUS INVESTIGATIONS AND CONCLUSIONS

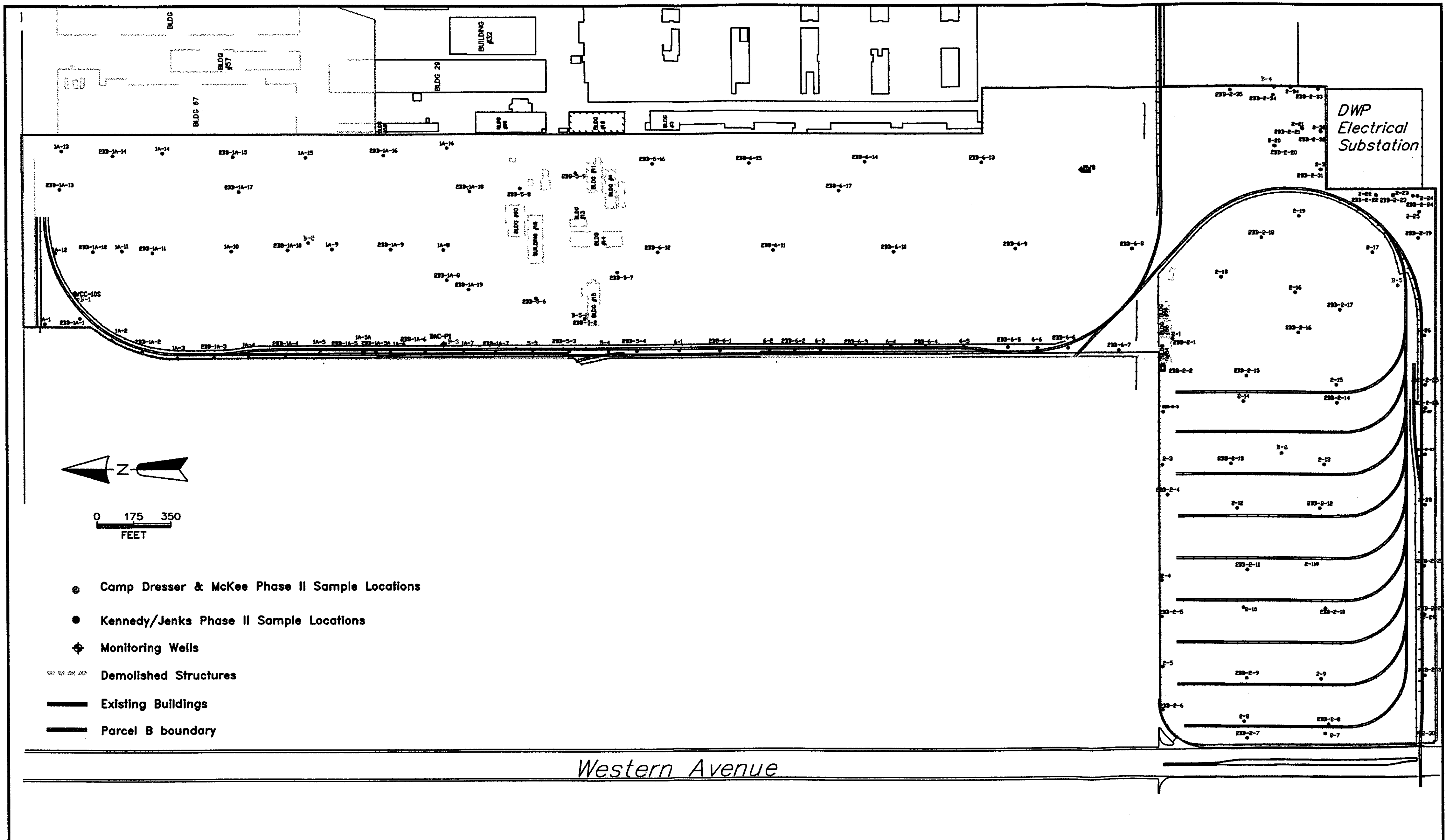
Four investigations of Parcel B have occurred since 1991: Phase I and II assessments of the northern parking lot and tool storage yard by Camp Dresser & McKee, Inc. (CDM) in 1991, and Phase I and II investigations by Kennedy/Jenks in 1996 and 1998, respectively. These studies and their findings are briefly discussed below.

2.1 CDM PHASE I AND II ENVIRONMENTAL ASSESSMENTS

In 1991, CDM completed Phase I and II environmental assessments of the northern parking lot and the tool storage yard. The Phase I report was submitted to MDRC in June 1991 and found no past or present activities within either area that would warrant an extensive Phase II investigation (CDM 1991b).

MDRC requested, however, a preliminary subsurface investigation to provide an additional level of confidence regarding subsurface soil conditions in these areas. This was prudent because groundwater contamination had been detected in a monitoring well (DAC-P1) installed at the western site boundary. The former ILM facility is believed to be the source of this contamination, and LMC has accepted responsibility for determining the off-site extent of ILM's groundwater impacts (IESI 1998).

CDM began the Phase II assessment in July 1991 and drilled six soil borings (B-1 through B-6) at the locations shown in orange in Figure 2-1. All soil samples were analyzed for volatile organic compounds (VOCs) using EPA Methods 8010 and 8020 and for Priority Pollutant Metals using EPA Methods 3050, 6010, and 7000. In addition, samples from two borings (B-4 and B-5) were analyzed for PCBs and organochlorine pesticides using EPA Method 8080 (CDM 1991b).



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INTEGRATED Environmental Services, Inc. 3990 Westerly Place, Suite 210 Newport Beach, CA 92660 (714) 852-9050	TITLE: Boeing C6 Facility Parcel B Previous Investigations Soil Sampling Locations	DWN: JDL CHKD: JFH DATE: 3-23-98	DES.: JDL APPD: JSB REV.: 2	PROJECT NO.: Boeing C-6 FIGURE NO.: 2-1

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Analytical results obtained showed detectable levels of an anthropogenic compound at only one of the locations sampled during the investigation. Chlorobenzene (8.4 µg/kg) was detected in only one sample collected from one boring (B-3). The detection limit for chlorobenzene is 5 µg/kg. No other VOCs were detected in any of the locations sampled. No PCBs or pesticides were detected either, and concentrations of metals were consistent with background values (CDM 1991b).

The data gathered during the Phase I and II assessments led CDM to conclude that no further investigations of the northern parking lot or tool storage yard are warranted, and that the probability of subsurface soil contamination within these areas is low (CDM 1991b).

2.2 KENNEDY/JENKS PHASE I ENVIRONMENTAL ASSESSMENTS

Kennedy/Jenks completed Phase I environmental assessments of Parcels A, B, and C in 1996 (K/J 1996a, b, and c). Historical documents and aerial photographs were reviewed as part of the assessment, and interviews with site personnel and site walkthroughs were conducted. No areas of environmental interest were identified within the area now designated "Parcel B."

2.3 KENNEDY/JENKS PHASE II SOIL INVESTIGATION

Kennedy/Jenks completed a Phase II soil investigation of Parcel B in January 1998 to characterize the nature of the soil and identify "areas of concern." The characterization was completed under the direction of the Los Angeles Region of the Regional Water Quality Control Board (RWQCB) with input from the Department of Toxic Substances Control (DTSC).

Fifty-two soil borings were drilled and 229 soil samples collected for analysis during the study. Soil borings advanced during the investigation are shown in magenta in Figure 2-1. All soil samples were analyzed for VOCs using EPA Methods 8260 and/or 8010/8020 and for total recoverable petroleum hydrocarbons (TRPH) using EPA Method 418.1 and/or 8015M. In addition, the following analyses were performed:

- Title 22 Metals using EPA Methods 6010, 7196, and 7471 for soil samples collected from the tool storage yard, scrap storage yard, area bordering the DWP substation, area bordering the Montrose Chemical site, area bordering the former ILM facility, the northern and southern parking lots, and the Parcel B building cluster.
- Semivolatile organic compounds (SVOCs) using EPA Method 8270 for soil samples collected from the tool storage yard, scrap storage yard, area bordering the DWP substation, and area bordering the Montrose Chemical site.
- PCBs using EPA Method 8080 for soil samples collected from the area bordering the DWP substation, area bordering the former ILM facility, the northern and southern parking lots, and the Parcel B building cluster.
- Pesticides using EPA Method 8080 for soil samples collected from the area bordering the Montrose Chemical site.

None of the areas sampled during the characterization were found to contain constituents at levels warranting the "area of concern" designation. Results obtained from the Phase II investigation are described below.

2.3.1 Tool Storage Yard

No VOCs or PCBs were detected in this area (K/J 1998).

Petroleum hydrocarbons were detected at low concentrations in 25 of the 53 samples collected from the yard. TRPH was detected at concentrations less than 270 mg/kg in 23 of the samples. TRPH was detected at 1.5 feet bgs in one boring (2-11B) at 3,200 mg/kg and at 4 feet bgs in another boring (2-15) at 6,000 mg/kg but was not detected in the deeper samples collected from these borings. Motor-oil-like hydrocarbons were detected in 7 samples at concentrations less than 710 mg/kg. The highest hit of this type of hydrocarbon, 3,000 mg/kg, occurred in one boring (2-17) at 4 feet bgs (K/J 1998).

In addition, in the vicinity of Buildings 54, 55, and 56, petroleum hydrocarbons and motor-oil-like hydrocarbons were detected in samples from one boring (2-1) at concentrations ranging from 12 to 150 mg/kg at depths ranging from 1 to 10 feet bgs.

The only SVOCs detected were bis(2-ethylhexyl)-phthalate and phenol. Bis(2-ethylhexyl)-phthalate was detected at concentrations ranging from 120 to 270 µg/kg in 7 of 53 samples at depths ranging from 1 to 10 feet bgs. Phenol was detected at 170 µg/kg in the 1-foot bgs sample from one boring (2-16) (K/J 1998).

Barium, chromium, cobalt, copper, nickel, vanadium, and zinc were detected at concentrations that appear typical of background values. Lead was detected in two borings (2-16 and 2-11B) at 1 and 2 feet bgs, respectively, at concentrations below 23 mg/kg, which is well below the TTLC of 1,000 mg/kg and less than 10 times the STLC.

2.3.2 Scrap Storage Yard

Tetrachloroethene (PCE) was detected in one boring (2-21) at concentrations of 7.8 and 5.2 µg/kg in the 1- and 4-foot bgs samples, respectively. No other VOCs were detected (K/J 1998).

Petroleum hydrocarbons, including TRPH and motor-oil-like hydrocarbons, were detected at low concentrations ranging from 16 to 450 mg/kg in 11 of 21 samples at shallow depths of 1 to 4 feet bgs (K/J 1998).

SVOCs were detected in 4 of 27 samples at concentrations less than 230 µg/kg. Certain SVOCs—benz(a)anthracene, chrysene, fluoranthene, phenanthrene, and pyrene—were detected in the 4-foot sample from one boring (2-21) at concentrations ranging from 150 to 470 mg/kg. Bis(2-ethylhexyl)-phthalate was detected at concentrations ranging from 110 to 230 µg/kg in four samples from three borings (2-21, 2-27, and 2-30) at depths to 10 feet bgs (K/J 1998).

Barium, chromium, cobalt, copper, nickel, vanadium, and zinc were detected at concentrations that appear typical of background values. Lead was reported in one boring (2-28) at 8.6 and 2.7 mg/kg in the 1- and 4-foot bgs samples. These lead concentrations are well below the TTLC of 1,000 mg/kg and less than 10 times the STLC (K/J 1998).

2.3.3 Area Bordering the DWP Electrical Substation

No VOCs or PCBs were detected in this area (K/J 1998).

Petroleum hydrocarbons, including TRPH and motor-oil-like hydrocarbons, were detected in 7 of 24 samples at concentrations ranging from 11 to 360 mg/kg. Six of these detections were at 1 or 4 feet bgs, and one (11 mg/kg) was at 25 feet bgs (K/J 1998).

The only SVOC detected in this area was bis(2-ethylhexyl)-phthalate, which was detected at 3,600 and 4,400 µg/kg in the 15- and 25-foot bgs samples, respectively, collected from Boring 2-31 (K/J 1998).

Barium, cobalt, copper, nickel, vanadium, and zinc were detected at concentrations that appear typical of background values.

2.3.4 Area Bordering Montrose Chemical

No pesticides, including dichlorodiphenyltrichloroethane (DDT), were detected in soil samples collected from the area bordering Montrose Chemical (K/J 1998).

Tetrachloroethene (TCE) and PCE were detected in only one soil sample (2-34) at a depth of 15 feet bgs at concentrations of 5.1 and 6.7 µg/kg, respectively. Chloroform was detected in the 15-foot bgs samples from two Borings (2-34 and 2-35) at 6.3 and 17 µg/kg, respectively (K/J 1998).

Petroleum hydrocarbons as TRPH were detected in 4 of 18 samples at concentrations ranging from 12 to 56 mg/kg. The highest concentration (56 mg/kg) was detected at 1 foot bgs in one boring (2-35), while concentrations of 12 and 13 mg/kg were detected in another (2-35) at 20 and 25 feet bgs, respectively (K/J 1998).

The only SVOC detected in this area was bis(2-ethylhexyl)phthalate, which was detected at concentrations ranging from 120 to 680 μg/kg in two borings (2-33 and 2-34) at depths ranging from 1 to 20 feet bgs (K/J 1998).

Barium, chromium, cobalt, copper, nickel, vanadium, and zinc were detected at concentrations that appear typical of background values (K/J 1998).

2.3.5 Area Bordering the Former ILM Facility

No PCBs were detected in soil samples collected along the border with the former ILM facility (K/J 1998).

TCE was detected in 25 of 40 soil samples collected from the 6 borings drilled in this area. Concentrations ranged from 5.9 to 52 μg/kg. Depending upon the boring, TCE was detected at depths ranging from 1 to 55 feet bgs (K/J 1998).

Petroleum hydrocarbons as TRPH were detected in three samples (two from Boring 6-5 and one from Boring 6-6) at concentrations ranging from 23 to 41 mg/kg and at shallow depths ranging from 1.5 to 4.5 feet bgs (K/J 1998).

Barium, chromium, cobalt, copper, nickel, vanadium, and zinc were detected at concentrations that appear typical of background values (K/J 1998).

2.3.6 Northern and Southern Parking Lots and the Building Cluster

No VOCs or PCBs were detected in soil samples collected from the northern and southern parking lots or the Parcel B building cluster (K/J 1998).

Petroleum hydrocarbons, including TRPH and motor-oil-like hydrocarbons, were detected in 17 of 61 samples at concentrations ranging from 16 to 200 mg/kg and at depths ranging from 1 to 10 feet bgs (K/J 1998).

Barium, chromium, cobalt, copper, nickel, vanadium, and zinc were detected at concentrations that appear typical of background values (K/J 1998).

2.4 CONCLUSIONS

The Phase II investigations conducted to date are believed to adequately characterize a majority of Parcel B. The only areas requiring additional characterization are the areas of interest (AOIs) identified during a review of the newly discovered aerial photographs and the building cluster, which could not be sampled during earlier investigations due to activities within the buildings. These areas are addressed in this SAP.

Neither the CDM nor the Kennedy/Jenks studies indicate the presence of constituents at elevated levels, and neither study designated any "areas of concern" within Parcel B. Only low levels of constituents were detected during those investigations, and in some instances, constituents detected in samples collected at the parcel boundary are consistent with operations at the neighboring site. Examples of this are the chlorobenzene detections observed during both studies from soil samples collected near the border with the Montrose Chemical site and the TCE detections observed in samples collected along the border with ILM during the Kennedy/Jenks investigation. Chlorobenzene was used in the manufacture of DDT, which was produced at Montrose Chemical, and the TCE impacts at ILM have been well documented.

It is believed that the characterization data obtained during the previous investigations, when supplemented with the data obtained during this investigation, will adequately characterize Parcel B given the currently available site information.

3. SAMPLE LOCATIONS AND ANALYSES

3.1 SAMPLE LOCATIONS

As described in Section 2, the Phase II soil characterization of Parcel B conducted by Kennedy/Jenks (K/J 1998) adequately characterized the vast majority of Parcel B. However, four areas of the parcel require additional investigation. These areas of interest (AOIs) are:

- AOI 1, Rectifier building concrete basins
- AOI 2, Two small electrical substations
- AOI 3, Transmission tower array
- AOI 4, Building cluster

AOIs 1 through 3 and one area within AOI 4 were unknown until the recent discovery of C-6 aerial photographs, taken between 1952 and 1956, and were therefore not considered in previous investigations. Although known as areas of potential environmental interest during the Kennedy/Jenks investigations, the Parcel B buildings in AOI 4 housed ongoing operations which prevented the collection of soil samples beneath the buildings. Analytical soil data obtained during the investigation of AOIs 1 through 4 will be used to supplement the existing Parcel B characterization data.

A brief description of each area and the rationale for classifying each as an AOI follow.

3.1.1 AOI 1, Rectifier Building Concrete Basins

Aerial photographs from 1953 show a line of uniform, concrete basins adjacent to the west side of the rectifier building. Measurements taken from the photographs indicate that the basins are approximately 10 to 15 feet in width and are spaced approximately 20 feet apart. The basins extend the length of the 950-foot building.

Recent excavation of some of the basins show that they are approximately 4 to 5 feet deep, have a seamless construction and are very clean. No staining is present in the basins currently unearthed, and no cracks have been observed. The basins contain a single opening in both the eastern and western walls which contain 4- to 5-inch-diameter piping. The configuration of the basins indicates that liquids may have entered from the pipe in the eastern wall and exited through the pipe in the western wall, or vice versa.

Although no documentation concerning the use of these basins has been found, it is believed that they were used for dissipating heat from cooling water. Metals, particularly chromium, are a concern at sites where cooling water may have been released. Chromium-containing compounds were widely used in cooling water systems as a corrosion inhibitor. Pesticides are also a concern since they may have been added to the water to kill insects that make their home in the water.

The most likely point of chemical release from the basins would be the piping system, since the unearthed basins appear solidly constructed and contain no cracks. Soil samples will be collected from beneath the eastern and western pipes and analyzed for metals and pesticides to evaluate whether releases may have occurred. Details concerning the collection of samples in AOI 1 are presented in Section 3.2.

3.1.2 AOI 2, Small Electrical Substations

Aerial photographs taken in 1952 show two small electrical substations in Parcel B, referred to in this SAP as the north and south substations. Measurements made from the photographs show the north substation to cover an area of 10,000 square feet, while the larger, south substation covers an area of approximately 30,000 square feet. The photographs show that each substation contains several large transformers. The transformers were removed from the site sometime between 1952 and 1953 during construction of the southern parking lot. Since it is not known whether the transformers were dry or contained oil with PCBs, or whether they leaked while in operation or during their removal, the substations were identified collectively as an AOI.

Based on this historical usage, and the possible presence of electrical transformers, soil samples will be systematically collected at both the north and south locations and analyzed for PCBs. Since site information does not indicate whether any of the transformers leaked, a systematic grid sampling approach will be used. Details concerning AOI 2 sampling are presented in Section 3.2.

3.1.3 AOI 3, Transmission Tower Array

The transmission tower array covered approximately 3.7 acres of the southern parking lot. No electrical transformers are visible within the array in aerial photographs taken in 1952, after DAC began operating the property for the US Navy. The array was removed sometime between 1952 and 1953, during construction of the southern parking lot. No quality photographs or written documentation from ALCOA concerning the transmission tower array have been found, and therefore the possible presence of transformers within the array during the three to four years that ALCOA operated the property must be considered.

As a conservative measure, soil samples will be collected from the former array area and analyzed for PCBs. Historical information does not indicate the potential for other constituents. Since the array is no longer present, and historical documents do not discuss the array, a systematic grid sampling approach will be employed. Details concerning the collection of samples in AOI 3 are presented in Section 3.2.

3.1.4 AOI 4, Building Cluster

The building cluster area contains a former aboveground storage tank area and buildings that were used primarily for office space or storage. Buildings of interest include Building 4, which housed electrical equipment and battery charging operations, Building 11, which at one point housed maintenance operations, and Building 15, which housed a photography laboratory. In addition, transformer oil was stored in three 8,000-gallon, aboveground tanks southeast of Building 13. Storage operations in the tank area and operations within Buildings 4, 11, and 15 may have resulted in the accidental release of chemicals to the environment. These areas, therefore, are areas of potential environmental interest. There have been no documented releases from any of the buildings or the storage tank area, however.

Building 60, the northernmost building in Parcel B, housed radar or radio test operations. Historical site records do not indicate the use of any chemicals during these tests, and therefore Building 60 and other structures associated with radar or radio testing (Section 2.3.2.7) are not considered areas of environmental interest.

As a conservative measure, soil samples will be collected from the footprints of Buildings 4, 11, and 15 after demolition and from the former aboveground tank area. The samples will be analyzed for constituents consistent with past operations, as follows:

Area	Constituents
Building 4	VOCs, SVOCs, Metals, and PCBs
Building 11	VOCs, SVOCs, and Metals
Building 15	VOCs and Metals
Storage Tank Area	PCBs

Details concerning the collection of soil samples in AOI 4 are presented in Section 3.2.

3.2 SOIL SAMPLING AND ANALYSIS

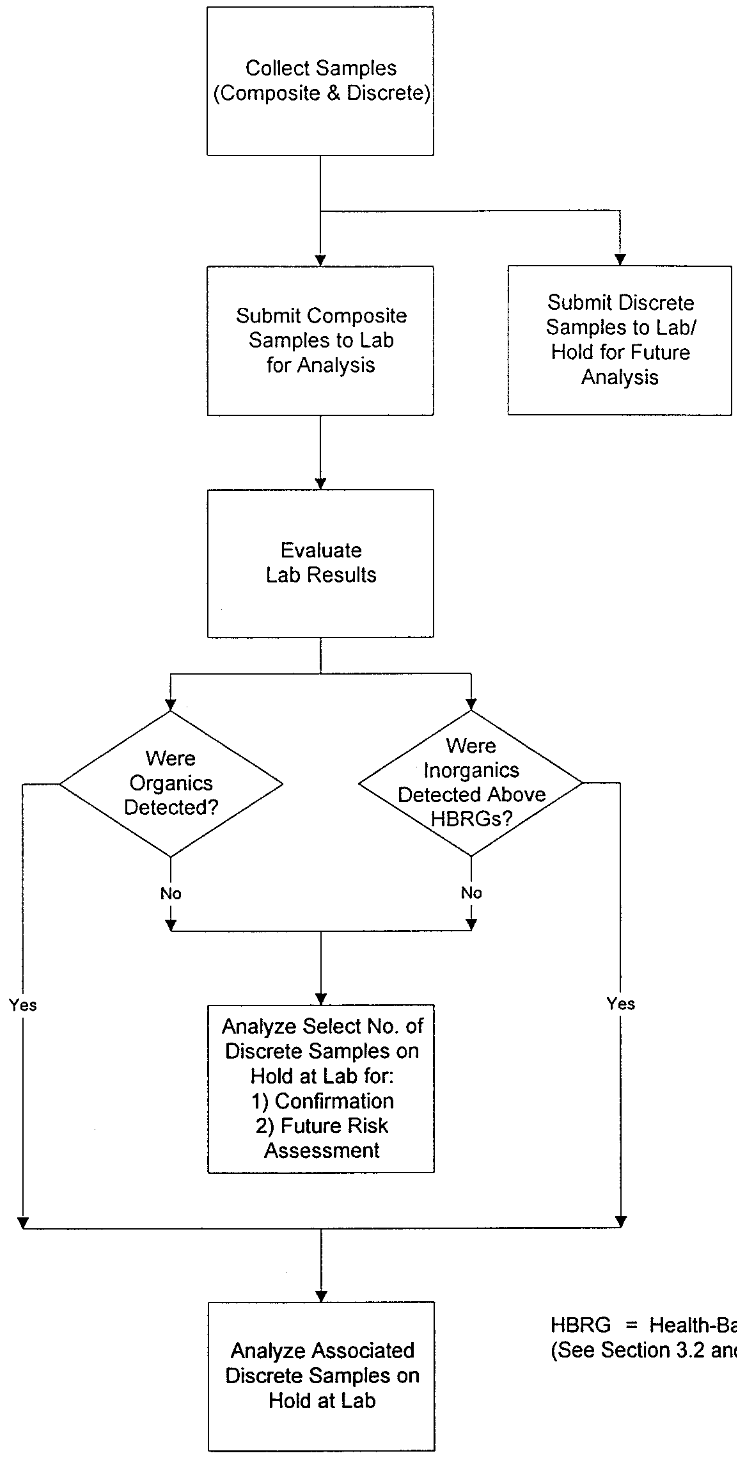
Soil samples will be collected from the four AOIs described in Section 3.1 to evaluate whether operations-related constituents are present in those areas. Samples will be collected from borings at AOI-specific locations and depths as discussed below. Borings will not be advanced to depths greater than 15 feet bgs. The depth to groundwater at the site is approximately 65 feet bgs and therefore will not be impacted by the soil boring activities.

The sampling approach for AOI 1 and the buildings in AOI 4 is designed so that soil samples will be collected from locations having the highest potential for a release. This is appropriate since structures are present and the most likely release points can be determined. A systematic grid sampling approach will be used to determine soil boring locations in AOI 2, AOI 3, and the storage tanks area in AOI 4. This approach is appropriate for areas where there are no existing structures with which to evaluate potential source points, and historical information concerning chemical releases is unavailable.

The overall approach for collecting and analyzing soil samples at Parcel B is presented in Figure 3-1. As shown in the figure, both composite and discrete soil samples will be collected during the supplemental investigation to allow the identification and delineation of potential source areas.

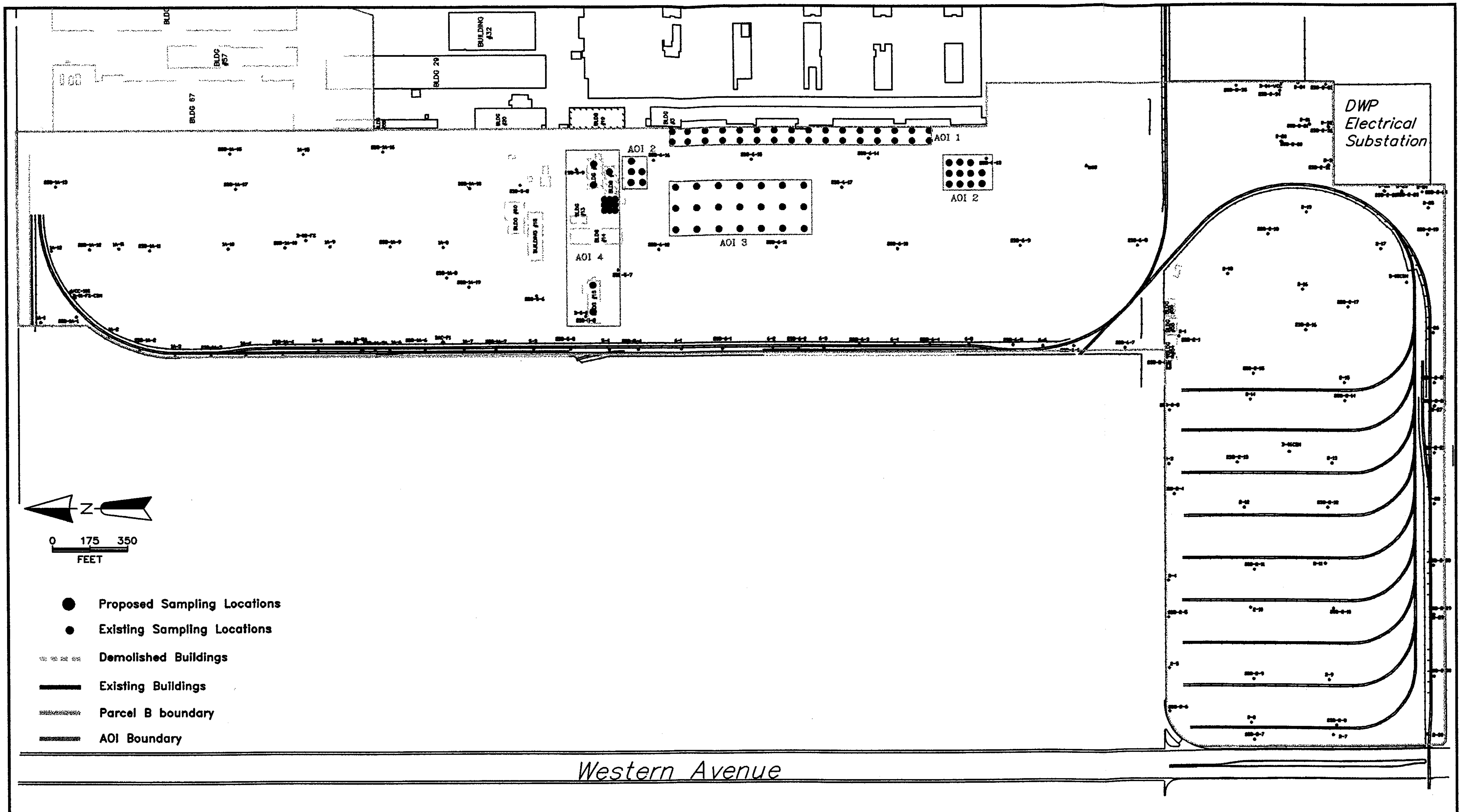
A composite sample consists of soil collected at the same depth from two or more adjacent borings. Composite samples are used to assess whether soils over a general area at a distinct depth have been impacted by former operating activities. A discrete sample is collected from a single boring and depth and is used to evaluate whether constituents are present in that specific location.

During this supplemental investigation of Parcel B, discrete soil samples will be collected in all four AOIs at the locations shown in Figure 3-2.



HBRG = Health-Based Remediation Goal
(See Section 3.2 and Appendix A)

FIGURE 3-1. PARCEL B SAMPLING AND ANALYSIS APPROACH



Note: AOI 1 will consist of 64 sample locations.
For purposes of this map, only 32 are displayed.

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TITLE: Boeing C-6 Facility Proposed Soil Sample Locations Parcel B	DWN: JDL	DES.: JPO	PROJECT NO.: Boeing C6
	CHKD: JFH	APPD: JSB	FIGURE NO.: 3-2
	DATE: 3-13-98	REV.: 3	

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BOE-C6-0095706

Composite samples will be collected in AOIs 1, 2, and 3 and the storage tank area in AOI 4 and will be obtained by collecting soil at the same depth in a single sleeve from two or more adjacent soil borings. Details on composite soil sampling for each AOI are presented in Sections 3.2.1 through 3.2.4.

All composite samples will be analyzed for the presence of AOI-specific constituents to determine whether soil collected in the composite sample has been impacted by former operations. The results of the composite sample analysis will determine whether the associated discrete samples will be analyzed. Discrete samples will be analyzed only if the associated composite samples indicate any detectable concentration of organic constituents or if detectable concentrations of inorganic constituents exceed the Health-Based Remediation Goals (HBRGs) for surface soils (IESI 1997).

It is important to note that the HBRG values have not been approved by DTSC as site cleanup goals and are used only for internal, soil-screening purposes. The use of these values does not guarantee DTSC approval of soil closure and are used at Boeing's own risk. It is understood by all parties that the findings of a parcel-specific, post-demolition risk assessment will establish whether Parcel B requires further remediation. The HBRGs are presented in Appendix A.

Discrete samples will be used to delineate the extent of the impacted soil. In the event that results from all composite samples collected from a single AOI report no detections for organic constituents or no detections above the HBRGs for inorganic constituents, then a select number of discrete samples will be analyzed to provide confirmation and the quality data necessary for use in the risk assessment.

AOI-specific sampling details are provided in Sections 3.2.1 through 3.2.4. Table 3-1 summarizes the sample location, number of borings, number of samples and sampling depth, and required analyses.

TABLE 3-1
SOIL SAMPLING SUMMARY

Location	No. of Borings	No. of Composite Sample Locations & Depths	No. of Composite Samples Analyzed	No. of Discrete Sample Locations & Depths	No. of Discrete Samples Analyzed[a]	Chemical Analyses[b]
AOI 1						
Rectifier Building Concrete Basins						
Concrete Basins	64[c]	32 at 5 ft. [d]	32	64 at 5 and 10 ft.	3	Pesticides and Metals
AOI 2						
Small Electrical Substations						
North Substation	5	2 at 1 and 5 ft. [e]	4	5 at 1 and 5 ft. [e]	2	PCBs
South Substation	11	3 at 1 and 5 ft [e]	6	11 at 1 and 5 ft. [e]	3	PCBs
AOI 3						
Transmission Tower Array						
Transmission Tower Area	21	7 at 5 and 10 ft. [e]	14	21 at 5 and 10 ft. [e]	5	PCBs
AOI 4						
Building Cluster						
Building 4	2	NA	NA	2 at 1, 5, 10, & 15 ft.[f]	4	VOCs, SVOCs, PCBs, Metals
Building 11	2	NA	NA	2 at 1, 5, 10, & 15 ft.[f]	4	VOCs, SVOCs, Metals
Building 15	2	NA	NA	2 at 1, 5, 10, & 15 ft.[f]	4	VOCs and Metals
Storage Tank Area	9	3 at 1 and 5 ft.	6	9 at 1 and 5 ft.	3	PCBs

Notes:
(a) Represents the minimum number of discrete samples that will be analyzed.
(b) Refer to Section 7.0 for analytical methods
(c) Actual number of samples collected from the concrete basins will be determined in the field.
(d) Estimated depth of compartment piping is 5 feet bgs. Soil sample will be collected from actual depth observed in the field.
(e) Soil samples collected from AOI2 and AOI3 will be at approximately 5 and 10 feet bgs, which corresponds to ground surface and 5 feet bgs, respectively, at the time the AOIs were operational.
(f) Discrete samples collected at 10 and 15 feet bgs will be submitted to the laboratory held. If samples at 1 and 5 feet bgs indicate soil has been impacted, the samples on hold will be analyzed and used to evaluate the vertical extent of the impact.

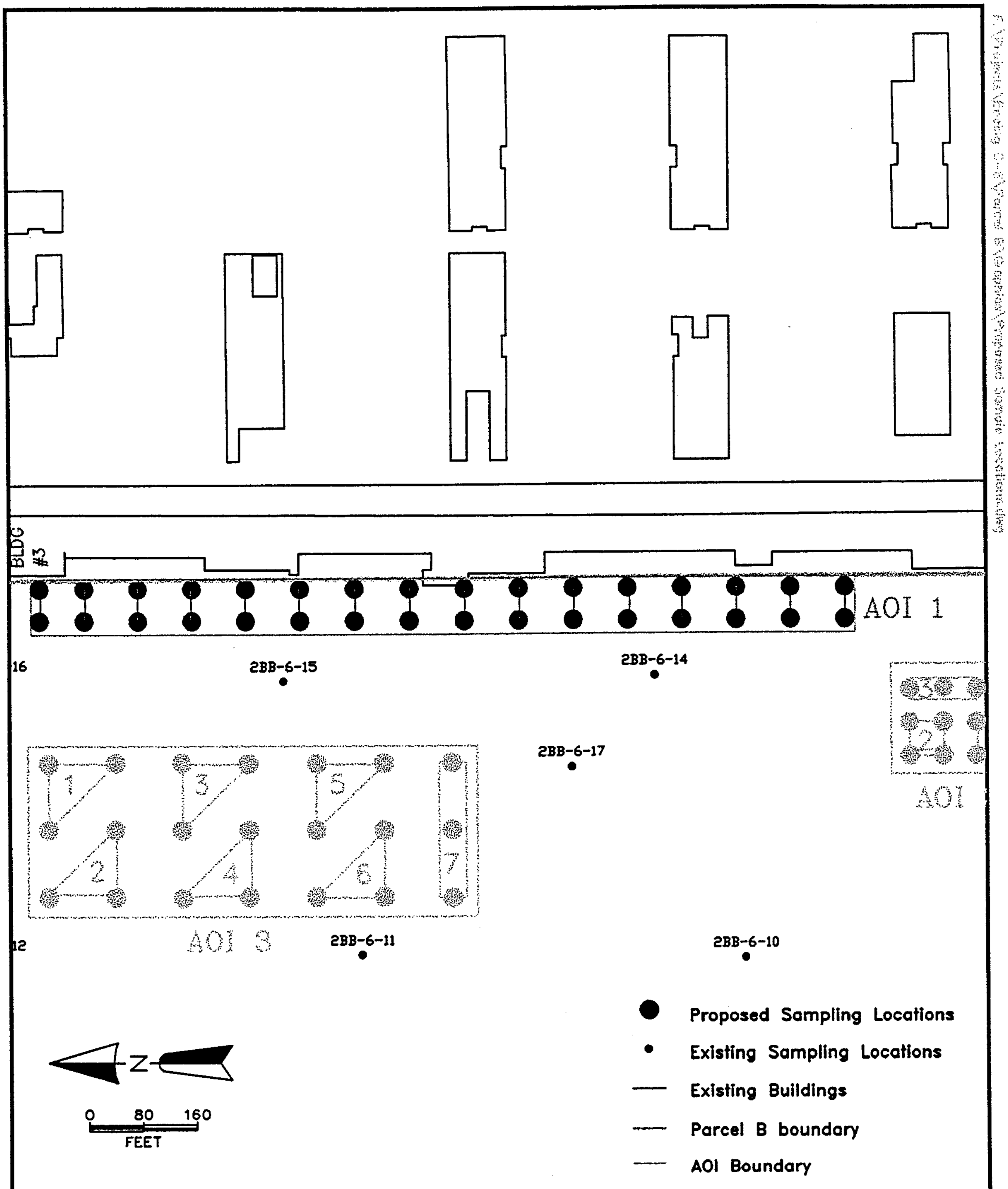
3.2.1 AOI 1, Rectifier Building Concrete Basins

Before soil borings are advanced in AOI 1, the concrete basins and associated piping will be completely exposed. The sampling approach proposed involves advancing one boring to 10 feet bgs on either side of each concrete basin near the inlet/outlet pipes. Based on a review of the aerial photographs, there appear to be 32 basins, so approximately 64 soil borings will be needed.

Soil samples will be collected at approximately 5 and 10 feet bgs from each boring. These depths correspond approximately to 1 and 5 feet bgs, respectively, before the area was filled in 1952 or 1953 and raised to the existing grade. The actual number of borings and the sample depths depend on the actual number of basins identified during field observations. Figures 3-2 and 3-3 present the proposed sampling locations for AOI 1

Two discrete soil samples will be collected from each of the 64 borings at the depths specified above for a total of 128 discrete soil samples. In addition, one composite sample will be collected at each basin at the 5-foot depth. No composite samples will be collected at 10 feet bgs. Each composite sample will be obtained by collecting soil at 5 feet bgs, in the same sleeve, from the borings on either side of the basin. The approximate composite sampling locations are identified in Figure 3-3. Based on the assumed number of concrete basins, 32 composite samples are estimated for AOI 1 (see Table 3-1).

Composite samples will be submitted to the laboratory for metals screening, using Energy Dispersive X-Ray Fluorescence (EDXRF), and for pesticides analysis. The discrete samples will also be submitted to the laboratory but placed on hold until the results of the composite samples have been evaluated. If any metal concentrations detected in a composite sample exceed the appropriate HBRGs, the associated discrete samples will be analyzed, using standard EPA methods, to delineate the metal-impacted soil. If any pesticides are detected in the composite sample, the associated discrete samples will be analyzed to delineate the pesticide-impacted soil. Additional soil borings may be advanced for delineation purposes.



Note: AOI 1 will consist of 64 sample locations.
For purposes of this map, only 32 are displayed.

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Boeing C-6 Facility Soil Boring Locations for AOI 1	CHKD: JFH	APPD: JSB	
	DATE: 3-23-98	REV.: 3	FIGURE NO.: 3-3

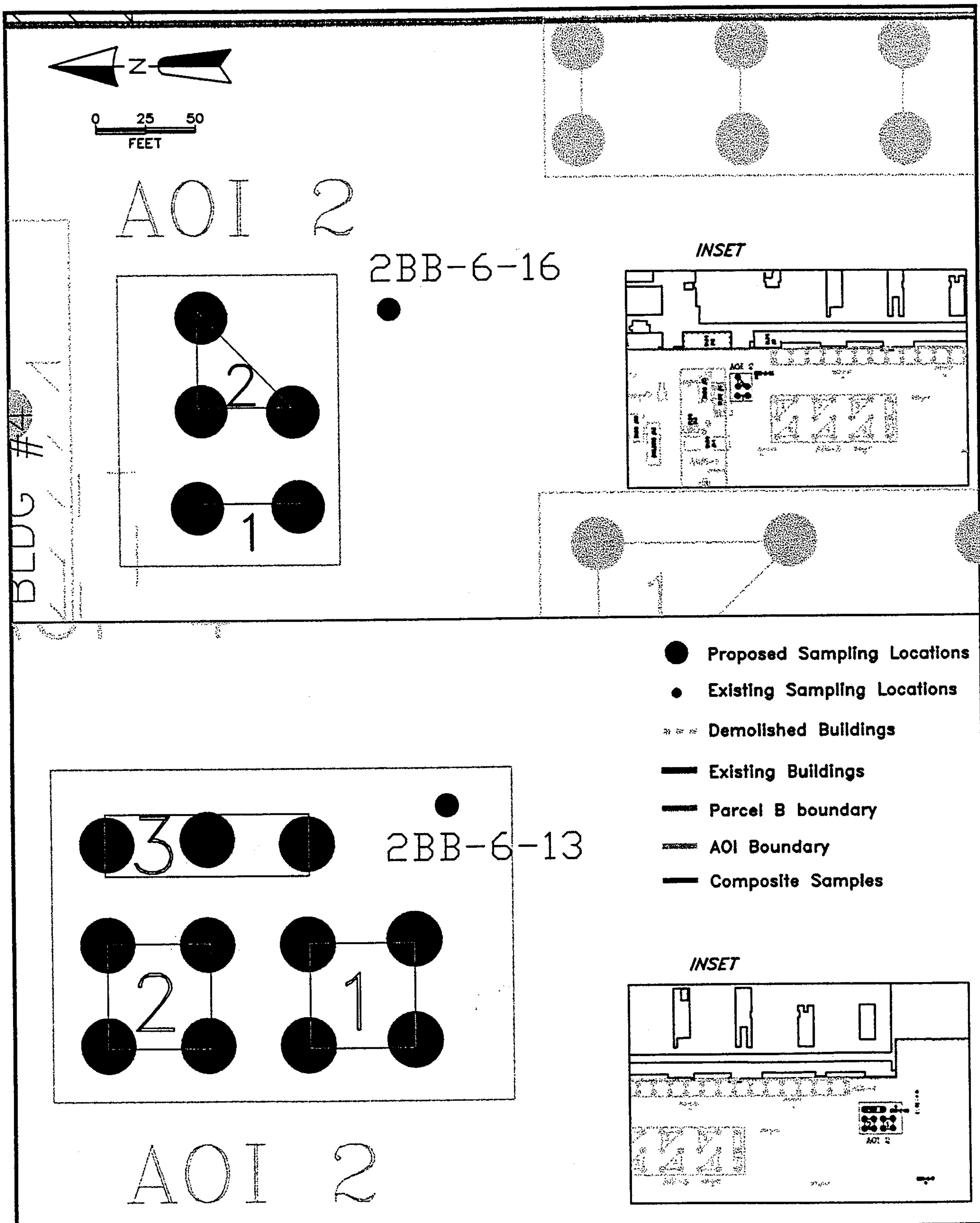
3.2.2 AOI 2, Small Electrical Substations

A systematic grid approach will be implemented at the north and south electrical substations. Soil borings will be advanced to a depth of 10 feet bgs at the nodes of a 50-by-50-foot grid overlying each of the substations. Soil samples will be collected at 1 and 5 feet bgs at the north substation and at 5 and 10 feet bgs at the south substation. Sampling depths at the south substation correspond approximately to 1 and 5 feet bgs, respectively, at the time the substations were operational. The area where the south substation was located was filled during construction of the southern parking lot to raise the existing grade. Figures 3-2 and 3-4 present the proposed grid sampling locations for AOI 2.

At the north electrical substation, five soil borings will be advanced over an area of approximately 100 by 150 feet (Figure 3-2). Two discrete soil samples will be collected from each of the borings for a total of 10 discrete soil samples. Composite samples will be collected from two locations (Figure 3-3) at depths of 1 and 5 feet bgs for a total of 4 composite samples (see Table 3-1).

At the south electrical substation, 11 soil borings will be advanced over an area of approximately 150 by 200 feet (Figure 3-4). Soil samples will be collected from each of the 11 borings at depths of 5 and 10 feet bgs for a total of 22 discrete soil samples. Composite samples will be collected from three locations (Figure 3-4) for a total of six composite samples (see Table 3-1).

The composite samples collected at each substation will be submitted to the laboratory and analyzed for PCBs. Discrete soil samples will also be submitted to the laboratory but placed on hold until the results of the composite samples have been evaluated. If PCB detections are reported in a composite sample, the associated discrete samples will be analyzed to delineate the PCB-impacted soil. Additional soil borings may be advanced for delineation purposes.



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		CHKD: JFH	APPD: JSB	
		DATE: 3-23-98	REV.: 2	FIGURE NO.: 3-4

3.2.3 AOI 3, Transmission Tower Array

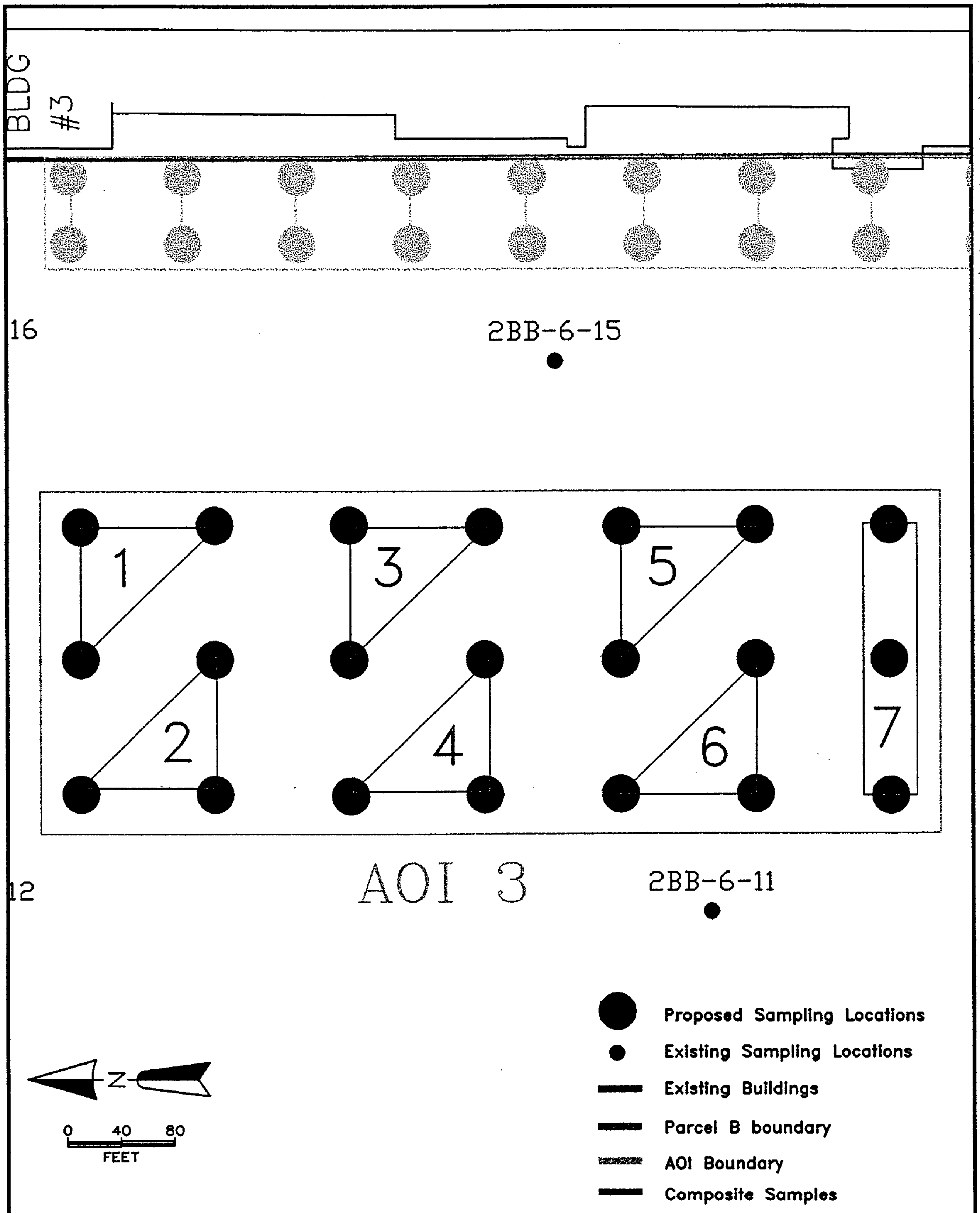
As with AOI 2, a systematic grid approach will be implemented at the former transmission tower array. Soil borings will be advanced to a depth of 10 feet bgs at the nodes of a 100-by-100-foot grid overlying the former array area. Soil samples will be collected at 5 and 10 feet bgs, which corresponds approximately to 1 and 5 feet bgs, respectively, at the time the array was present. The area where the towers were located was filled during construction of the southern parking lot to raise the existing grade an provide a level area for the lot. Figures 3-2 and 3-5 present the proposed grid sampling locations for AOI 3.

Twenty-one soil borings will be advanced over an area of approximately 200 by 600 feet (Figure 3-5). Two discrete soil samples will be collected at 5 and 10 feet bgs from each of the 21 borings for a total of 42 discrete soil samples. Seven composite sampling locations are shown in Figure 3-5. From these locations, a total of 14 composite samples will be collected (see Table 3-1).

The composite samples will be submitted to the laboratory for PCB analysis. Discrete samples will also be submitted to the laboratory but placed on hold until the results of the composite samples have been evaluated. If any detection of PCBs is reported in a composite sample, the associated discrete samples will be analyzed to delineate the PCB-impacted soil. Additional soil borings may be advanced for delineation purposes.

3.2.4 AOI 4, Building Cluster Area

Two soil borings each will be advanced to 15 feet bgs in the footprints of Buildings 4, 11, and 15 at the locations proposed in Figure 3-2. Discrete soil samples will be collected from each boring at 1, 5, 10, and 15 feet bgs. The discrete samples collected at 1 and 5 feet bgs will be submitted to the laboratory for the analyses indicated in Table 3-1. Discrete samples collected at 10 and 15 feet bgs will also be submitted to the laboratory but will be held until the shallow samples are analyzed. The 10 and 15 feet bgs samples will be analyzed only if constituents are detected in the



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TITLE:
Boeing C-6 Facility
Soil Boring Locations for AOI 3

DWN: JDL	DES.: JPO	PROJECT NO.: Boeing C6
CHKD: JFH	APPD: JSB	FIGURE NO.: 3-5
DATE: 3-23-98	REV.: 3	

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1 and 5-foot samples. Analytical results will be compared to HBRGs to evaluate whether potential soil impacts have occurred. In the event soil impacts are identified, additional borings may be advanced for delineation purposes.

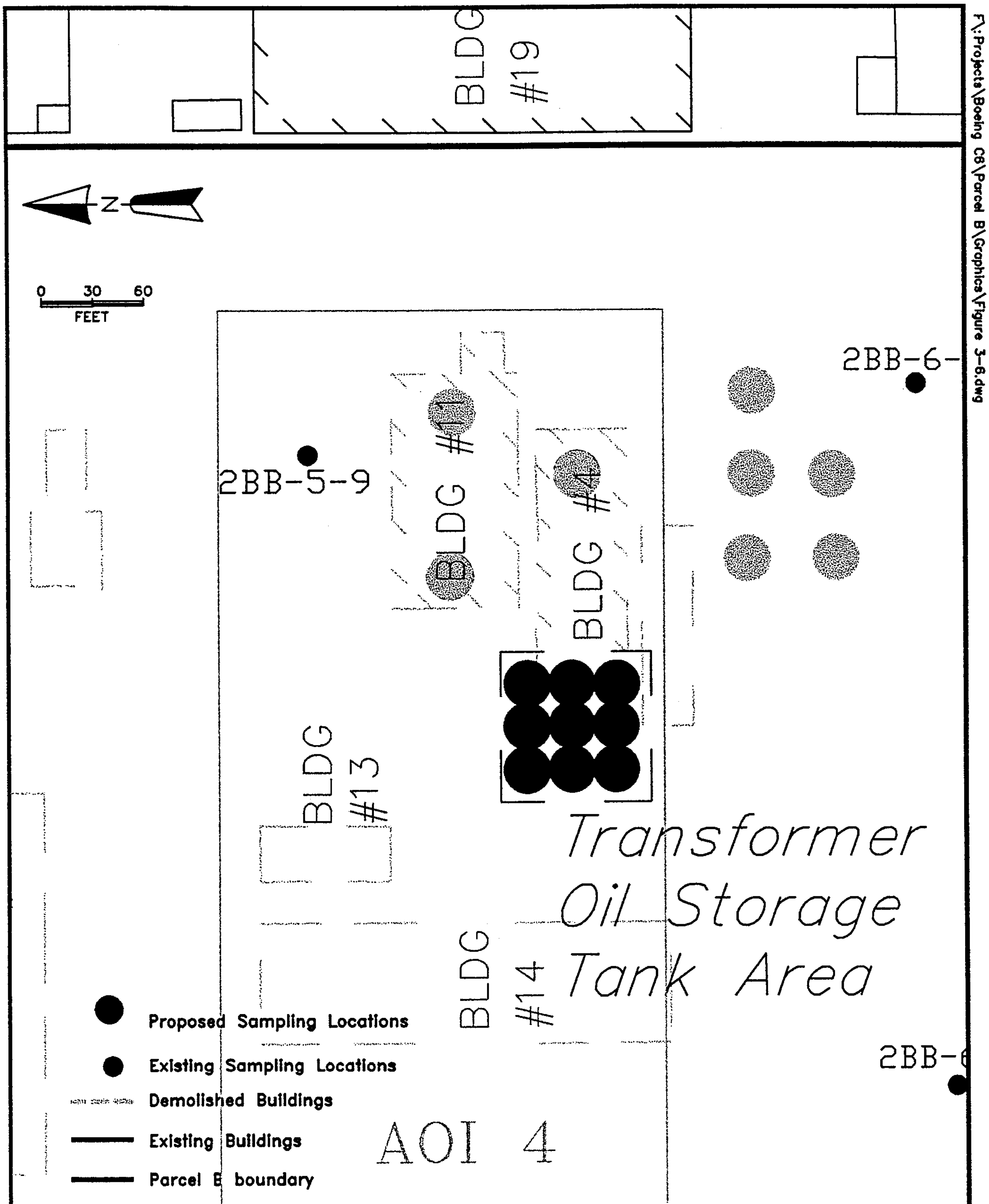
Nine soil borings will be advanced to 5 feet bgs in the area of the former transformer-oil storage tanks at the locations proposed in Figure 3-2. Discrete soil samples will be collected from each boring at 1 and 5 feet bgs for a total of 18 samples (Table 3-1). In addition, composite samples will be collected at the three locations shown in Figure 3-6 and analyzed for PCBs. Composite samples for each composite sampling location will be collected at the 1- and 5-foot depths for a total of six composite samples (Table 3-1). The sampling proposed for the transformer-oil storage area is more dense than that of other grid-sampled areas in Parcel B due to the higher probability of chemical releases in the storage tank area during loading and unloading operations.

The composite samples will be submitted to the laboratory for PCB analysis. Discrete samples will also be submitted to the laboratory but placed on hold until the results of the composite samples have been evaluated. If any detection of PCBs is reported in a composite sample, the associated discrete samples will be analyzed to delineate the PCB-impacted soil. Additional soil borings may be advanced for delineation purposes.

3.3 Quality Assurance/Quality Control Samples

Standard laboratory quality assurance/quality control (QA/QC) procedures will be followed to ensure the quality of the analytical results obtained from all soil samples. In addition, four types of field QA/QC samples will be collected and analyzed:

- Trip blanks
- Field blanks
- Equipment rinsates
- Field duplicates



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TITLE: Boeing C6 Facility
Soil Boring Locations for AOI 4
Storage Tank Area

DWN: JDL	DES.: JPO	PROJECT NO.: Boeing C6	
CHKD: JFH	APPD: JSB	FIGURE NO.: 3-6	
DATE: 3-22-98	REV.: 2		

Collection and analyses of trip blanks, field blanks, equipment rinsates, and field duplicates are intended as QA/QC checks on the representativeness of the samples collected, the precision of sample collection and handling procedures, and the thoroughness of the field equipment decontamination procedures between sampling events. A sampling event is considered to start when the sampling personnel arrive at the site and end when these personnel leave for more than one week.

Trip blanks, field blanks, and equipment rinsates are prepared using analyte-free water and sample containers. All blanks will be handled and analyzed in the same manner as samples collected from the site. Sample numbers for the blanks collected shall be sequential with the samples collected (see Section 4). The field QA/QC samples will be collected as follows:

- One trip blank per cooler per sampling team will be prepared for every batch of VOC samples.
- One field blank will be collected per decontamination water source per event. The blank and associated investigative sample will be analyzed for the same parameters.
- Equipment rinsates will be collected for soil sampling. The rinsate and associated investigative sample will be analyzed for the same parameters. One equipment blank sample will be taken for each soil sample collection method (e.g., hand trowels, split-spoon samplers) per event.
- One field duplicate sample for every 20 soil samples or every sample area will be collected. Field duplicate samples will be collected from adjacent stainless steel liners. The duplicate and associated investigative sample will be analyzed for the same parameters.

Table 3-2 presents the number of QA/QC samples to be collected during this supplemental sampling effort.

TABLE 3-2
QA/QC SAMPLES

Sample Type	AOI 1	AOI 2	AOI 3	AOI 4	Chemical Analysis
Trip Blanks	0	0	0	1	VOCs, SVOCs, PCBs, Metals
Field Blanks	0	0	0	1	VOCs, SVOCs, PCBs, Metals
Equipment Rinsates	0	0	0	1	VOCs, SVOCs, PCBs, Metals
Field Duplicates					
Composite	2	1	1	NA[(a)]	See note[(b)]
Discrete	3	1	1	1	See note[(b)]

Notes:
(a) NA = Not Applicable
(b) Field duplicate samples and associated investigative sample will be analyzed for the same analytical parameters. Analytical parameters for each AOI are presented in Table 3-1.

3.4 Utility Survey

Before any sampling or other intrusive activities have begun, a utility location survey will be conducted to identify any subsurface structures that may impede boring at the proposed sampling locations. The results of the survey will be used to modify the proposed sampling locations, if necessary.

3.5 Land Survey

The soil sampling locations will be surveyed by a registered land surveyor using horizontal accuracies of ±0.1 feet. The surveyor will generate a scaled base map of the site showing the locations of all surveyed features.

3.6 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

Investigation-derived waste (IDW) generated during the site investigation activities will consist of soil cuttings, decontamination water, and discarded personal protective equipment (PPE). Following completion of the field activities, disposal options will be recommended based on the findings of the investigation. The type and quantity of the IDW anticipated during implementation of the above activities are summarized in Table 3-3.

TABLE 3-3
ANTICIPATED IDW GENERATED DURING PARCEL B

IDW Type	Estimated Quantity (55-gallon drums)
Soil Cuttings	
AOI 1	32[a]
AOI 2	9[a]
AOI 3	11[a]
AOI 4	6[b]
PPE Visqueen	2[c]
Decontamination Rinse Water	6[d]

Notes:

(a) Estimated assuming that one 55-gallon drum will be required to contain soil cuttings from two of the soil borings advanced to 10 feet bgs. Note that at AOI2, 3 drums will be required for the north substation and 6 drums will be required for the south substation

(b) Estimated assuming that one 55-gallon drum will be required to contain soil cuttings from each of the six soil borings advanced to 15 feet bgs.

(c) Estimated assuming that one 55-gallon drum will be required to contain discarded PPE and visqueen for each week of field sampling (assuming 2 weeks of field sampling).

(d) Estimated assuming that three 55-gallon drums will be required to contain decontamination rinse water for each week of field sampling (assuming 2 weeks of field sampling).

4. Sample Identification and Designation

All samples collected at Parcel B will be assigned a sample identification number to distinguish each individual sample from all other samples. This identification number will be used on all documentation relating to collection, handling, analysis, and reporting of the analytical results of each individual sample. Since a sample is normally analyzed for several different chemical constituents or parameters that require different sample containers and preservation techniques, the same sample identification number will be assigned to each portion of the original sample split among individual sample containers. The method of identification of a sample will depend on the type of soil sample collected measurement taken, and analysis performed.

Samples will be numbered in consecutive order as they are collected within each area of interest (AOI). Duplicate samples will be assigned the same number as the original, with a "D" following to indicate "duplicate." The following two sample designation templates will be used for discrete and composite samples, respectively:

Discrete Samples

AOIw-Bx-y-z

where

AOIw	=	area of interest (e.g., AOI1)
Bx	=	boring identification (e.g., B1)
y	=	sample number for boring identification (sequentially numbered samples collected from each boring, e.g., 1, 2, 3)
z	=	sample depth (expressed in feet below ground surface)

For example, the second discrete soil sample collected from the fourth soil boring at a depth of 5.5 feet bgs, and advanced at AOI 1 would be designated AOI1-B4-2-5.5. The first sample from the same boring at a depth of 1.5 feet bgs would be designated AOI1-B4-1-1.5.

Composite Samples

AOIw-Cx/Ba,b,c-y-z

where

AOIw	=	area of interest (e.g., AOI1)
Cx	=	Composite identification (e.g., C1)
Ba,b,c	=	Boring identifications making up the composite sample
y	=	sample number for composite identification (sequentially numbered samples collected from each composite location, e.g., 1, 2, 3)
z	=	sample depth (expressed in feet below ground surface)

For example, the second composite soil sample collected from the second cluster of soil borings (Borings B4, B5, and B6) at a depth of 5 feet bgs advanced in AOI 2 would be designated AOI2-C2/B4,5,6-2-5. The first sample from the same boring cluster at a depth of 1.5 feet bgs would be designated AOI2-C2/B4,5,6-1-1.5.

QC samples will be numbered and designated as follows:

- Trip Blank-#
- Field Blank-#
- Rinsate-#

Sample labels provided by the laboratory will be affixed to each individual sample collected. The label on each sample collected during the site investigation will contain the following information:

- Project name and location
- Project number
- Sample identification number
- Date and time of collection
- Name or initials of sampler
- Analyses to be performed

5. SAMPLING PROCEDURES AND EQUIPMENT

5.1 SOIL SAMPLING

Soil samples will be collected using hand trowels, hand augers, or split-spoon samplers, depending on the depth of the desired sample. Section 3 of this SAP discusses the proposed number and locations of soil samples to be collected. The actual number and locations will be determined based on field observations and field screening results obtained from soil cuttings. Soil cuttings will be screened using a photoionization detector (PID) to evaluate whether a potential source is present. Results of the screening will be recorded on the field forms.

5.2 EQUIPMENT DECONTAMINATION PROCEDURES

All materials and equipment that come into contact with potentially contaminated soil, drilling fluid, or water will be decontaminated prior to and after each use. Decontamination of equipment will prevent or minimize cross contamination in samples and sampled media, which is important for preventing the introduction of error into sampling results and for protecting the health and safety of site personnel. Decontamination will consist of steam cleaning or a nonphosphate detergent scrub, followed by fresh-water and distilled-water rinses. After materials and equipment are decontaminated, they will be stored on clean plastic sheeting in an uncontaminated area.

The following decontamination procedures will be used for sampling materials and equipment:

- Drill rigs, augers, drill rods and any other equipment placed in the hole during drilling will be steam cleaned prior to use and between borings. Visible soil and grease will be removed with a stiff brush.

- Soil samplers, as well as trowels and hand augers used to collect soil samples, will be cleaned prior to initial use and between uses, either by steam cleaning or as follows:
  - Nonphosphate detergent wash
  - Tap-water rinse
  - Distilled-water rinse (two to three times)

5.3 CALIBRATION PROCEDURES

Calibration is the process of adjusting an instrument response to match that of a known reference standard. These procedures ensure the operator that the instrument is operating properly and will generate reliable data.

Procedures described in this section pertain to the calibration of equipment and instrumentation in the field and laboratory. The procedures reference SOPs when available and specify calibration frequency and standards. All calibrations for field and laboratory equipment will be recorded in appropriate field notebooks.

5.3.1 Field Instrument Calibration

Devices shall be calibrated and adjusted at specified, predetermined intervals using appropriate equipment and material (e.g., calibrated gases). All equipment will be checked daily and recalibrated when the difference between the reference standard and instrument readout exceeds +/- 10 percent, or a smaller percentage if suggested by the manufacturer. Instruments will be recalibrated anytime they are subjected to conditions outside the range of normal use or anytime field personnel suspect that the calibration may have been altered. Instruments will be recalibrated prior to use after they have been subjected to a sudden impact from being dropped or mishandled or after significant changes in temperature or humidity, or when their batteries have been depleted. The instrument user is responsible for operating and calibrating equipment in the proper manner.

The Field Operations Manager is responsible for ensuring that the following are implemented for field-calibrated equipment:

- A list will be established of the instruments to be calibrated and the frequency of calibration for each. The method and interval of calibration shall be based on the instrument's stability characteristics, required accuracy, and other conditions affecting measurement control.

- The range, type, and accuracy of the instruments in use will be appropriate for the tests being performed.

- A master calibration file will be maintained for each instrument and will include, at a minimum, the following information:
  - Name of instrument/model number
  - Serial and/or identification number
  - Frequency of calibration
  - Date of last calibration
  - Name of party performing last calibration
  - Due date for next calibration
  - Identification of the calibration gas or solution

- Instruments will be marked with calibration due dates whenever possible. When this is not possible, alternative methods of tracing the device to its calibration date shall be employed.

The only field instrument planned for use during the Parcel B supplemental sampling program is the PID, which will be calibrated against 100 ppm of isobutylene in zero air.

5.3.2 Laboratory Instrument Calibration

The laboratory instruments used during the analysis of samples will be calibrated according to, and at the frequency indicated by, the specific analytical methods used. All instruments will be calibrated through the use of standard solutions of known concentrations. Standards will be prepared from certified reference solutions obtained from approved chemical vendors.

As stated above, the instruments will be calculated at a frequency defined by the specific analytical methods used, but the calibration will be continuously verified by analysis of calibration standards or laboratory control samples at regular intervals. Calibration will be performed at specified intervals, as determined by the performance of the instrument in the field.

6. Sample Handling and Analytical Procedures

All samples will be handled according to the procedures contained or referenced in this section. The sample containers and preservation measures to be used are specified in Section 6.1. Analytical procedures are presented in Section 6.2. Field logs and sample custody forms will also be maintained, and all samples will be labeled as specified in Section 7.5.

6.1 Sample Containers and Preservation Measures

The use of proper sample containers is important to ensure that the analytical data collected truly represent site conditions, that the sample volumes are sufficient for analysis, and that the potential for the container itself to contaminate the samples is negligible.

Clean sample containers will be supplied by the laboratory. Sample containers shall remain in storage containers during transport to the sampling location and until the time of actual sample collection to avoid any introduction of contaminants. Stainless steel liners will be supplied by the drilling subcontractor. Prior to sample collection, the stainless steel liners will be cleaned in accordance with the decontamination procedures described in Section 5.2. The sample containers, preservation measures, and holding times presented in Table 6-1 are those specified under the respective methods for each analysis.

Sample preservation prevents or retards the degradation or modification of chemicals and retards biological activity in samples during transit and storage. Efforts to preserve the integrity of the samples will be initiated at the time of the sampling and will continue until the analyses are performed.

TABLE 6-1
SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

Parameter	Analytical Method	Matrix[a]	Container[b]	Sample Volume	Preservation Measure	Holding Time[c]
VOCs	EPA 8260	soil	Stainless steel liner or glass jar	4 oz	Cool, 4°C	14 days
		water	Borosilicate glass 40-ml vial with teflon-lined septum [d]	40 ml in duplicate	Cool, 4°C HCL to pH <2 Cool container to 4°C prior to sampling. Store in dark.	14 days
SVOCs	EPA 8270	soil	Stainless steel liner or glass jar	4 oz	Cool, 4°C	14 days until extraction; 40 days after extraction
		water	Amber glass with teflon-lined cap	1 liter	Cool, 4°C Cool container to 4°C prior to sampling. Store in dark.	7 days until extraction; 40 days after extraction
Title 22 Metals[e]	EPA 6010	soil	Stainless steel liners or glass jars	8 oz	Cool, 4°C	6 months
		water	Polyethylene or glass bottle	100 ml	HNO_3 to pH <2	6 months
Chromium (VI)	EPA 7196	soil	Stainless steel liners or glass jars	4 oz	Cool, 4°C	6 months
		water	Polyethylene or glass bottle	100 ml	No preservatives for Cr^{+6} analysis.	6 months

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TABLE 6-1 (CONTINUED)
SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

Parameter	Analytical Method	Matrix	Container[a]	Sample Volume	Preservation Measure	Holding Time[b]
Mercury	EPA 7471	soil	Stainless steel liners or glass jars	4 oz	Cool, 4°C	26 days
		water	Polyethylene or glass bottle	100 ml	HNO_3 to pH <2	26 days
Pesticides/ PCBs[e]	EPA 8080	soil	Stainless steel liners or glass jars	4 oz	Cool, 4°C	7 days until extraction; 40 days after extraction
		water	Amber glass with teflon-lined cap	1 liter	Cool, 4°C	7 days until extraction; 40 days after extraction

Notes:
(a) The water samples to be analyzed during this investigation are only QA/QC samples. No groundwater samples will be collected.
(b) The volume of containers to be used for all other analysis will depend on the total number of parameters for which the sample in a given container is to be analyzed. This table specifies minimum values.
(c) Soils submitted for analyses are extracted within 14 days and analyzed within 40 days after extraction. Soils submitted for volatile organic compound analysis are extracted within 24 hours.
(d) 40ml vials will be filled with zero headspace.
(e) The metals and pesticides/PCBs analysis can come out of the same container as the sample volume collected for SVOCs.

6.2 Analytical Procedures

Analytical procedures performed for the Parcel B investigation will include both field measurements and laboratory analyses. Because field instrumentation and analytical methodologies are continually being updated, field personnel are required to consult the equipment manual of each manufacturer for current operating procedures.

6.2.1 Field Measurements

Field personnel will record field measurements on standardized logs and will maintain field logbooks in which all data will be recorded (see Section 7.5).

The only field measurement to be made at Parcel B will be the VOC vapor analysis of sample headspace using a photoionization detector (PID). The PID is a portable, nonspecific, vapor/gas detector which measures gaseous levels of a variety of organic compounds. The PID will be calibrated using isobutylene, which provides a mid-range response for most constituents of interest, is relatively safe to use, and is readily available from the supplier. The PID contains an ultraviolet light source within its sensor chamber. Ambient air is drawn into the chamber. If the ionization potential of any molecule present in the ambient air is equal to or lower than the energy of the ultraviolet light source, ionization will take place, causing a deflection in the meter. The PID will be used to monitor soil cuttings during drilling operations. Cutting samples will be measured by holding the tip of the probe at the surface of the sample for 5 seconds. Response time is approximately 90 percent at 3 seconds. The measurements are reported in parts per million. All readings will be recorded in the field notebook.

6.2.2 Laboratory Analyses

Laboratory analytical methods to be used on samples collected as part of the investigation are presented in Table 6-1. Detection limits obtained during analysis will be reported for each parameter in each sample. Highly contaminated samples or samples containing interfering substances may result in elevated detection limits. Tables 6-2 through 6-4 present the detection limits for the analytical methods to be performed on soil samples.

The laboratory analytical procedures that may be used for the samples collected from Parcel B are as follows:

EPA Method	Analyte
8260	VOCs
8270	SVOCs
EDXRF/6010/7196/7471	Metals
7196	Chromium (VI)
8080	PCBs and Pesticides

All work completed on a sample set will be recorded in laboratory notebooks. All analyses will be performed in accordance with the analytical laboratory's QA/QC plan and the appropriate analytical methods.

TABLE 6-2
DETECTION LIMITS FOR VOCs IN SOIL
(EPA METHOD 8260)

VOC	Detection Limit (μg/kg)	VOC	Detection Limit (μg/kg)
1,1,1-trichloroethane	5	chlorobenzene	5
1,1,2,2-tetrachloroethane	5	chloroethane	15
1,1,2-trichloroethane	5	chloroform	5
1,1-dichloroethane	5	chloromethane	15
1,2-dichlorobenzene	5	cis-1,2-dichloroethene	5
1,2-dichloroethane	5	cis-1,3-dichloropropane	5
1,2-dichloropropane	5	dibromochloromethane	5
1,3-dichlorobenzene	5	ethylbenzene	5
1,4-dichlorobenzene	5	methylene chloride	10
2-butanone	10	styrene	5
2-hexanone	10	tetrachloroethene	5
4-methyl-2-pentanone	10	toluene	5
acetone	10	trans-1,2-dichloroethene	5
benzene	5	trans-1,3-dichloropropene	5
bromodichloromethane	5	trichloroethene	5
bromoform	5	vinyl chloride	15
bromomethane	20	xylenes (total)	5
carbon disulfide	5		
carbon tetrachloride	5		

Source: EPA SW846

TABLE 6-3
DETECTION LIMITS FOR SVOCs IN SOIL
(EPA METHOD 8270)

SVOC	Detection Limit (mg/kg)	SVOC	Detection Limit (mg/kg)
1,2,4-trichlorobenzene	30	benzo(g,h,i)perylene	140
1,2-dichlorobenzene	60	benzo(k)fluoranthene	130
1,4-dichlorobenzene	50	benzoic acid	430
2,4,5-trichlorophenol	210	benzyl alcohol	100
2,4,6-trichlorophenol	170	bis (2-ethylhexyl) phthalate	180
2,4-dimethylphenol	130	bis(2-chloroethoxy) methane	100
2,4-dinitrophenol	600	bis(2-chloroethyl) ether	60
2,4-dinitrotoluene	230	bis(2-chloroisopropyl) ether	50
2,6-dinitrotoluene	100	butylbenzylphthalate	110
2,-dichlorophenol	190	carbazole	130
2-chloronaphthalene	70	chrysene	120
2-chlorophenol	160	dibenzo(a,h)anthracene	210
2-methylnaphthalene	60	dibenzofuran	90
2-methylphenol	270	diethylphthalate	170
2-nitroaniline	90	dimethylphthalate	80
2-nitrophenol	140	di-n-butylphthalate	130
3,3'-dichlorobenzidine	2000	di-n-octylphthalate	70
3-nitroaniline	270	fluoranthene	40
4,6-dinitro-2-methylphenol	240	fluorene	80
4-bromophenyl-phenylether	90	hexachlorobenzene	80
4-chloroaniline	400	hexachlorobutadiene	30
4-chloro-e-methylphenol	190	hexachlorocyclopentadiene	30
4-chlorophenyl-phenylether	90	hexachloroethane	40
4-methylphenol	270	indeno(1,2,3-cd)pyrene	210
4-nitroaniline	650	isophorone	90
4-nitrophenol	30	naphthalene	50
acenaphthene	70	nitrobenzene	50
acenaphythylene	70	n-nitroso-di-n-propylamine	120
anthracene	110	n-nitrosodiphenylamine	20
benzo(a)anthracene	150	pentachlorophenol	210
benzo(a)pyrene	150	phenanthrene	80
benzo(b)fluoranthene	70	pyrene	120

Source: EPA SW846

TABLE 6-4
DETECTION LIMITS FOR METALS IN SOIL

Metal	EPA Analysis Method	EPA Method Detection Limit (mg/kg)	EDXRF Screening Detection Limit (mg/kg)
antimony	6010	5.0	10
arsenic	6010	1.0	10
barium	6010	0.1	10
beryllium	6010	0.1	—
cadmium	6010	0.1	10
chromium	6010	0.05	20
chromium (vi)	7196	0.5	—
cobalt	6010	0.5	—
copper	6010	0.1	10
lead	6010	1.0	10
mercury	7471	0.01	10
molybdenum	6010	0.5	—
nickel	6010	0.5	10
selenium	6010	5.0	10
silver	6010	0.1	10
thallium	6010	5.0	10
vanadium	6010	0.5	—
zinc	6010	0.1	10

Source: EPA SW846

7. SAMPLE HANDLING AND CUSTODY

Sample custody procedures are designed in accordance with EPA requirements for sample control. To establish the documentation required to trace sample possession from the time of collection to the time of analysis, a chain-of-custody form will be completed and will accompany every sample during transportation to the designated analytical laboratory.

The following information will be completed on the chain-of-custody form:

- Project number
- Total samples shipped
- Date when the samples are relinquished
- Signature of the sample collector
- Sample identification
- Date and time when the samples are collected
- Sample type
- Container type
- Sample preservation measures
- Analyses requested and analytical level
- Signature of the person(s) involved in the chain of possession

7.1 FIELD CUSTODY PROCEDURES

The following chain-of-custody procedures will be implemented to maintain and document possession of samples:

1. Samples will be collected as described in this SAP.
2. The Field Operations Manager is personally responsible for the care and custody of the samples collected until they are properly transferred or dispatched to the analytical laboratory.
3. Labels will be completed for each sample, using waterproof ink.
4. If a sample label is lost during shipment (or if one was never prepared), a written statement will be prepared detailing how the sample was collected and transferred to the laboratory. The statement will include all pertinent information, such as entries in field log books regarding the sample, whether the sample was in the sample collector's physical possession or in a locked compartment until hand-transported to the laboratory, etc.

7.2 TRANSFER OF CUSTODY AND SHIPMENT

The following procedures will be implemented when transferring custody of samples:

1. Samples will be accompanied by a chain-of-custody form. This form documents custody transfers from the sampler, through any other persons, to the analyst in the laboratory. When transferring possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the form.
2. Samples will be packaged properly for shipment and dispatched to the laboratory for analysis; a separate custody form will accompany each shipment (e.g., one custody form per sample cooler) and will identify its contents. Shipping containers will be sealed for shipment. The method of shipment, courier name(s), and other pertinent information will be entered in the "Special Instructions" section of the custody form.
3. The original chain-of-custody form will accompany the shipment; a copy will be retained by the Field Operations Manager for the project record. The original form will be placed

inside the shipping container which will then be sealed. The courier will not be required to sign the form, since the container will be sealed.

4. If sent by mail, the package will be registered with a return-receipt request. If sent by common courier or air freight, proper documentation must be maintained (e.g., bill of lading).

7.3 Laboratory Custody Procedures

The following procedures will be implemented when the samples arrive at the laboratory:

1. A designated sample custodian will take custody of all samples upon their arrival at the laboratory. If delivered to the laboratory after duty hours or when the custodian is not present, the samples will be placed in a designated sample area in accordance with the procedures established by the laboratory.
2. The custodian will inspect all sample labels and chain-of-custody forms to ensure that the information on each corresponds and that all are completed properly.
3. The custodian will then assign a unique laboratory number to each sample and transfer the samples to secured storage areas maintained at 4°C. The laboratory sample number must be traceable back to the field sample identification number and will be used to identify the sample during storage, analysis, data reduction, data validation, and reporting.
4. The custodian will enter the sample label data into the sample-tracking system of the laboratory. This system will use the sample label and will ensure that all samples are transferred to the proper analyst or stored in the appropriate secure area.

7.4 SAMPLE PACKAGING AND SHIPPING

7.4.1 Sample Packaging

Samples will be packaged according to the following procedures:

1. The custody seal will be wrapped around the end of each container and signed and dated by the sampler.
2. Glass sample containers will be wrapped with plastic insulating material to prevent contact with other sample containers or the inner wall of the cooler.

7.4.2 Shipping Containers

Samples will be packaged in rigid, thermally insulated coolers that contain ice (triple-bagged in plastic) or Blue Ice and absorbent packing for liquids or foam packing for solids. The completed chain-of-custody form will be placed inside the shipping container, unless otherwise noted. The container will be secured with strapping tape to prevent opening during shipment.

7.4.3 Marking and Labeling

The cooler will be marked as follows:

- Proper shipping name, i.e., “Liquid Environmental Samples” or “Solid Environmental Samples.”
- Class, i.e., "This Side Up" or arrows placed on opposite sides of the outer container if shipping liquid.

Two strips of custody tape will be placed on each cooler, one strip on the front and one on the back, located in a manner that would indicate whether tampering had occurred.

7.5 FIELD LOGS

Daily logs will be maintained on site by the Field Operations Manager to provide a daily record of significant events, observations, and measurements during field operations. The daily logs will be maintained in a bound field notebook. All entries will be made legibly in indelible ink, signed, and dated. Field notebooks are intended to provide sufficient data and observations to enable participants to reconstruct the events of the project investigation. The field notebook entries will be factual, detailed, and objective. Information to be recorded in the field notebook includes, but is not limited to, the following:

- Date, time, and place of sampling
- Field QC samples, as applicable
- Weather conditions at the time of sampling, including ambient temperature and approximate wind direction and speed
- Data from field analyses (pH, air sampling, etc.)
- Observations about the site and samples (odors, appearance, etc.)
- Information about any extraneous activities that may affect the integrity of the samples (e.g., emissions from nearby operations)
- Analyses and required preservation techniques
- Sample cooler temperature readings

7.5.1 Corrections to Documentation

Unless restricted by weather conditions, all original data recorded in field notebooks, sample identification tags, and chain-of-custody forms will be written in waterproof ink. The chain-of-custody forms are accountable, serialized documents and are not to be destroyed, even if they are illegible or contain inaccuracies that require replacement documentation.

An error discovered on an accountable document will be corrected by the person who made the entry. Corrections are made by crossing out the error with a single line and entering the correct information. The erroneous information should not be obliterated. All corrections will be initialed and dated.

7.5.2 Disposition of Documentation

Upon conclusion of the field effort at Parcel B, field documentation (maps, well logs, logbooks, etc.) will be clearly labeled and placed in the project files.

7.6 LABORATORY FILES

Laboratory files will be maintained for each project for at least five years. The file will contain all data and reports, including raw data calculation sheets, chromatograms, and mass spectrums, and all written and computerized records of laboratory handling and analysis will also be maintained as part of the permanent file. Specific storage and formatting requirements for laboratory data will be specified by Integrated Environmental Services, Inc. and provided to the laboratory contracted to analyze samples collected during the supplemental Parcel B sampling program.

8. References

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APPENDIX A
HEALTH-BASED REMEDIATION GOALS

TABLE A-1
HEALTH-BASED REMEDIATION GOALS (HBRGs),
ORGANIC CONSTITUENTS IN SOIL

Constituent	Construction Worker Initial HBRG	Commercial/ Industrial User Initial HBRG	Final HBRG
1-butanol	1.98E+04	3.46E+04	1.98E+04
1,1-dichloroethane	2.23E+03	1.10E+03	1.10E+03
1,1-dichloroethene	1.57E+01	4.21E+00	4.21E+00
1,1,1,2-tetrachloroethane	4.98E+02	1.44E+04	4.98E+02
1,1,2-trichloroethane	2.23E+02	1.26E+03	2.23E+02
1,1,2,2-tetrachloroethane	6.25E+01	1.50E+03	6.25E+01
1,2-dibromo-3-chloropropane	2.42E+00	7.47E+01	2.42E+00
1,2-dibromoethane	4.86E+00	1.84E+02	4.86E+00
1,2-dichlorobenzene	NA	2.64E+06	2.64E+06
1,2-dichloroethane	2.06E+02	2.66E+02	2.06E+02
1,2-dichloropropane	3.37E+01	7.25E+00	7.25E+00
1,2-diphenylhydrazine	2.03E+01	2.36E+08	2.03E+01
1,2,3-trichloropropane	2.39E+00	4.08E+01	2.39E+00
1,2,4-trichlorobenzene	1.74E+02	4.74E+07	1.74E+02
1,3-dichloropropene	4.83E+01	6.63E+02	4.83E+01
1,4-dichlorobenzene	4.32E+02	4.37E+04	4.32E+02
2-butanone	3.28E+04	2.35E+06	3.28E+04
2-chlorophenol	8.57E+02	1.17E+06	8.57E+02
2-methylphenol	8.66E+03	7.59E+07	8.66E+03
2-naphthylamine	9.81E+00	1.63E+06	9.81E+00
2,4-dichlorophenol	5.21E+01	2.22E+07	5.21E+01
2,4-dimethylphenol	3.48E+03	4.37E+08	3.48E+03
2,4-dinitrophenol	3.49E+01	7.14E+09	3.49E+01
2,4-dinitrotoluene	3.48E+01	7.62E+06	3.48E+01
2,4,5-trichlorophenol	1.73E+04	2.21E+08	1.73E+04
2,4,6-trichlorophenol	2.52E+02	1.10E+07	2.52E+02

**TABLE A-1 (CONTINUED)
HEALTH-BASED REMEDIATION GOALS (HBRGs),
ORGANIC CONSTITUENTS IN SOIL**

Constituent	Construction Worker Initial HBRG	Commercial/ Industrial User Initial HBRG	Final HBRG
2,6-dinitrotoluene	2.59E+01	4.51E+05	2.59E+01
3,3-dichlorobenzidine	1.47E+01	7.53E+08	1.47E+01
4-chloroaniline	6.93E+01	6.50E+06	6.93E+01
4-methyl-2-pentanone	1.20E+04	6.84E+05	1.20E+04
4-methylphenol	8.69E+01	4.01E+07	8.69E+01
4,4-DDD	1.03E+02	9.97E+08	1.03E+02
4,4-DDE	7.28E+01	2.83E+06	7.28E+01
4,4-DDT	1.22E+01	2.26E+08	1.22E+01
acenaphthene	8.10E+03	1.62E+08	8.10E+03
acetone	1.55E+04	4.37E+05	1.55E+04
acrolein	NA	8.05E+01	8.05E+01
acrylonitrile	1.59E+01	7.65E+01	1.59E+01
aldrin	7.32E-01	2.82E+04	7.32E-01
alpha-BHC	3.93E+00	2.32E+05	3.93E+00
aniline	3.10E+03	1.02E+07	3.10E+03
anthracene	4.06E+03	1.37E+10	4.06E+03
aroclor 1016	NA	7.35E+05	7.35E+05
aroclor 1254	8.70E-01	5.69E+05	8.70E-01
benzene	1.43E+02	1.71E+02	1.43E+02
benzidine	3.52E-02	1.55E+02	3.52E-02
benzoic acid	6.96E+04	6.58E+10	6.96E+04
benzo(a)anthracene	1.14E+01	1.13E+09	1.14E+01
benzo(a)pyrene	1.14E+00	9.56E+07	1.14E+00
benzo(b)fluoranthene	1.14E+01	3.19E+08	1.14E+01
benzo(k)fluoranthene	1.14E+01	9.56E+07	1.14E+01
benzyl alcohol	1.73E+04	3.81E+08	1.73E+04
benzyl chloride	1.00E+02	4.03E+03	1.00E+02
beta-BHC	1.38E+01	9.94E+06	1.38E+01
beta-chloronaphthalene	NA	2.32E+07	2.32E+07
bis(2-chloro-1-methylethyl)ether	2.49E+02	2.93E+04	2.49E+02
bis(2-chloroethyl)ether	6.91E+00	6.91E+02	6.91E+00
bis(2-ethylhexyl)phthalate	2.10E+03	3.59E+09	2.10E+03
bromodichloromethane	1.30E+02	2.94E+03	1.30E+02

**TABLE A-1 (CONTINUED)
HEALTH-BASED REMEDIATION GOALS (HBRGs),
ORGANIC CONSTITUENTS IN SOIL**

Constituent	Construction Worker Initial HBRG	Commercial/ Industrial User Initial HBRG	Final HBRG
bromoform	3.34E+02	1.28E+05	3.34E+02
bromomethane	NA	1.15E+02	1.15E+02
carbazole	8.83E+02	6.66E+08	8.83E+02
carbon disulfide	1.43E+03	7.04E+04	1.43E+03
carbon tetrachloride	9.71E+01	1.35E+02	9.71E+01
chlordane	1.04E+00	1.55E+05	1.04E+00
chlorobenzene	NA	2.83E+04	2.83E+04
chloroform	1.49E+02	9.58E+02	1.49E+02
chloromethane	7.43E+02	7.40E+01	7.40E+01
chrysene	1.14E+02	5.06E+10	1.14E+02
cis-1,2-dichloroethene	1.34E+03	7.51E+03	1.34E+03
cumene	3.79E+03	5.73E+04	3.79E+03
dibenzo(a,h)anthracene	3.35E+00	6.34E+11	3.35E+00
dibromochloromethane	1.50E+02	1.54E+02	1.50E+02
dichlorodifluoromethane	2.14E+03	7.01E+02	7.01E+02
dieldrin	1.22E+00	2.33E+04	1.22E+00
diethyl phthalate	1.39E+05	6.03E+09	1.39E+05
di-n-butylphthalate	1.74E+04	4.19E+08	1.74E+04
di-n-octylphthalate	3.49E+02	1.80E+10	3.49E+02
endosulfan	1.46E+02	2.14E+08	1.46E+02
endrin	7.33E+00	1.37E+08	7.33E+00
ethyl chloride	1.42E+05	1.57E+06	1.42E+05
ethylbenzene	NA	7.33E+05	7.33E+05
fluoranthene	6.97E+03	3.03E+10	6.97E+03
fluorene	6.94E+03	1.40E+08	6.94E+03
gamma-BHC	2.32E+01	2.63E+05	2.32E+01
heptachlor	2.87E+00	1.78E+03	2.87E+00
heptachlor epoxide	3.14E-01	1.35E+03	3.14E-01
hexachlorobenzene	9.69E+00	2.80E+03	9.69E+00
hexachlorobutadiene	2.24E+02	7.13E+04	2.24E+02
hexachlorocyclopentadiene	8.87E+01	9.79E+02	8.87E+01
hexachloroethane	1.73E+02	2.39E+05	1.73E+02
indeno(1,2,3-cd)pyrene	1.47E+01	1.23E+11	1.47E+01
isobutyl alcohol	4.81E+04	2.55E+06	4.81E+04

**TABLE A-1 (CONTINUED)
HEALTH-BASED REMEDIATION GOALS (HBRGs),
ORGANIC CONSTITUENTS IN SOIL**

Constituent	Construction Worker Initial HBRG	Commercial/ Industrial User Initial HBRG	Final HBRG
isophorone	1.85E+04	2.92E+07	1.85E+04
methoxychlor	8.71E+01	1.48E+09	8.71E+01
methyl methacrylate	1.06E+03	5.56E+04	1.06E+03
methylene bromide	1.51E+03	2.75E+04	1.51E+03
methylene chloride	1.07E+03	1.26E+03	1.07E+03
methyl-tert-butyl ether	NA	1.39E+06	1.39E+06
n-butylbenzyl phthalate	3.48E+03	6.52E+09	3.48E+03
nitroaniline, o-	8.07E+03	2.45E+06	8.07E+03
nitrobenzene	8.61E+01	1.78E+05	8.61E+01
nitrosodiphenylamine, p-	8.02E+02	1.03E+07	8.02E+02
n-nitrosodimethylamine	2.60E-01	1.38E-02	1.38E-02
n-nitroso-di-n-propylamine	2.48E+00	4.46E+02	2.48E+00
n-nitrosodiphenylamine	1.96E+03	4.80E+09	1.96E+03
o-chlorotoluene	3.14E+03	1.05E+05	3.14E+03
p-chloro-m-cresol	3.48E+04	NA	3.48E+04
pentachlorophenol	3.04E+02	3.09E+07	3.04E+02
phenol	1.04E+04	3.14E+09	1.04E+04
pyrene	2.35E+03	4.11E+10	2.35E+03
styrene	3.02E+05	7.58E+06	3.02E+05
tetrachloroethene	3.36E+02	7.52E+03	3.36E+02
toluene	3.12E+04	2.41E+05	3.12E+04
toxaphene	1.47E+01	9.16E+04	1.47E+01
trans-1,2-dichloroethene	2.68E+03	1.47E+04	2.68E+03
trichloroethene	1.05E+03	1.39E+03	1.05E+03
trichlorofluoromethane	1.03E+04	4.89E+04	1.03E+04
vinyl acetate	5.41E+03	2.31E+05	5.41E+03
vinyl chloride	5.16E+00	1.81E-01	1.81E-01
xylenes	3.26E+04	2.61E+07	3.26E+04

NA = Not Available

TABLE A-2
HEALTH-BASED REMEDIATION GOALS (HBRGs),
INORGANIC CONSTITUENTS IN SOIL

Constituent	Initial HBRG	Background Level*	Final HBRG
aluminum	NT	3.63E+04	3.63E+04
antimony	9.05E+00	5.00E+00	9.05E+00
arsenic	8.87E+00	1.40E+01	1.40E+01
barium	2.52E+03	2.81E+02	2.52E+03
beryllium	1.56E+01	7.40E-01	1.56E+01
cadmium	1.64E+01	8.80E-01	1.64E+01
calcium	NT	3.80E+04	3.80E+04
chromium III	3.22E+04	4.10E+01	3.22E+04
chromium VI	9.73E+01	NA	9.73E+01
cobalt	NT	2.00E+01	2.00E+01
copper	1.26E+03	5.30E+01	1.26E+03
cyanide	6.99E+02	NA	6.99E+02
iron	NT	6.05E+04	6.05E+04
lead	NT	1.11E+02	1.11E+02
mercury	6.78E+00	2.80E-01	6.78E+00
molybdenum	1.24E+03	2.30E+01	1.24E+03
nickel	2.39E+02	2.90E+01	2.39E+02
potassium	NT	8.26E+03	8.26E+03
selenium	1.82E+02	1.24E+03	1.24E+03
silver	1.30E+02	2.39E+02	2.39E+02
sodium	NT	1.96E+03	1.96E+03
thallium	NT	1.10E+01	1.10E+01
titanium	NT	1.95E+03	1.95E+03
vanadium	8.37E+01	8.20E+01	8.37E+01
zinc	8.73E+03	1.98E+02	8.73E+03

*Background values from ILM Baseline Risk Assessment (G&M 1996).

NA = Not Available
NT = No Toxicity values available for calculation of HBRG